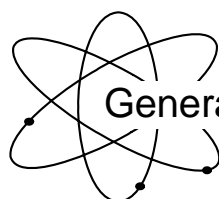




**US Army Corps  
of Engineers**

Hydrologic Engineering Center

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Generalized Computer Program

# **HEC-4**

## **Monthly Streamflow Simulation**

### **User's Manual**

**February 1971**

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CPD-4

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HEC-4

MONTHLY STREAMFLOW SIMULATION

HYDROLOGIC ENGINEERING CENTER  
COMPUTER PROGRAM 723-X6-L2340

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MONTHLY STREAMFLOW SIMULATION

HYDROLOGIC ENGINEERING CENTER  
COMPUTER PROGRAM 723-X6-L2340

1. ORIGIN OF PROGRAM

This program was prepared in The Hydrologic Engineering Center, Corps of Engineers. Up-to-date information and copies of source statement cards for various types of computers can be obtained from the Center upon request by Government and cooperating agencies. Programs are furnished by the Government and are accepted and used by the recipient upon the express understanding that the United States Government makes no warranties, express or implied, concerning the accuracy, completeness, reliability, usability, or suitability for any particular purpose of the information and data contained in the programs or furnished in connection therewith, and the United States shall be under no liability whatsoever to any person by reason of any use made thereof.

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2. PURPOSE OF PROGRAM

This program will analyze monthly streamflows at a number of inter-related stations to determine their statistical characteristics and will generate a sequence of hypothetical streamflows of any desired length having those characteristics. It will reconstitute missing streamflows on the basis of concurrent flows observed at other locations and will obtain maximum and minimum quantities for each month and for specified durations in the recorded, reconstituted and generated flows. It will also use the generalized simulation model for generating monthly streamflows at ungaged locations based on regional studies. There are many options of using the program for various related purposes, and it can be used for other variables such as rainfall, evaporation, and water requirements, alone or in combination.

3. DESCRIPTION OF EQUIPMENT

This program requires a FORTRAN IV compiler, a random number generator (function RNGEN included, see exhibit 2), and a fairly large memory (64K on the CDC 6600). Provision is made for use of three scratch tapes, 7 (for punched output), 8 and 9.

4. METHODS OF COMPUTATION

a. In the statistical analysis portion of this program, the flows for each calendar month at each station are first incremented by 1 percent of their calendar-month average in order to prevent infinite negative

logarithms. This increment is later subtracted. The mean, standard deviation and skew coefficients for each station and calendar month are then computed. This involves the following equations:

$$X_{i,m} = \log (Q_{i,m} + q_i) \quad (1)$$

$$\bar{X}_i = \sum_{m=1}^N X_{i,m} / N \quad (2)$$

$$S_i = \sqrt{\sum_{m=1}^N (X_{i,m} - \bar{X}_i)^2 / (N-1)} \quad (3)$$

$$g_i = N \sum_{m=1}^N (X_{i,m} - \bar{X}_i)^3 / ((N-1)(N-2)S_i^3) \quad (4)$$

in which:

- X = Logarithm of incremented monthly flow
- Q = Monthly recorded streamflow
- q = Small increment of flow used to prevent infinite logarithms for months of zero flow
- $\bar{X}$  = Mean logarithm of incremented monthly flows
- N = Total years of record
- S = Unbiased estimate of population standard deviation
- g = Unbiased estimate of population skew coefficient
- i = Month number
- m = Year number

b. For each station and month with incomplete record, a search is made for longer records among the stations used, to find that which will contribute most toward increasing the reliability of the statistics computed from the incomplete record. The mean and standard deviation are then adjusted. Equation 5 is used to compute the equivalent record required to obtain statistics equally reliable to these adjusted statistics and is the basis for selecting the best record to be used in the adjustment. Equations 6 and 7 are the adjustment equations.

$$N_1' = \frac{N_1}{1 - \frac{N_2 - N_1}{N_2} R^2} \quad (5)$$



$$\bar{x}'_1 - \bar{x}_1 = (\bar{x}'_2 - \bar{x}_2) RS_1/S_2 \quad (6)$$

$$s'_1 - s_1 = (s'_2 - s_2) R^2 S_1/S_2 \quad (7)$$

The primes indicate the long-period values and those without primes are based on the same short period for both stations 1 and 2, and:

N = Length of record  
R = Linear correlation coefficient

c. Each individual flow is then converted to a normalized standard variate, using the following approximation of the Pearson Type III distribution:

$$t_{i,m} = (x_{i,m} - \bar{x}_i) / s_i \quad (8)$$

$$K_{i,m} = 6/g_i \left[ ((g_i t_{i,m}/2) + 1)^{1/3} - 1 \right] + g_i/6 \quad (9)$$

t = Pearson Type III standard deviate  
K = Normal standard deviate

d. After transforming the flows for all months and stations to normal, the gross (simple) correlation coefficients R between all pairs of stations for each current and preceding calendar month are computed by use of the following formula:

$$R_{i,i-1} = \left\{ 1 - \left[ 1 - \left( \sum_{m=1}^N x_{i,m} x_{i-1,m} \right)^2 / \left( \sum_{m=1}^N x_{i,m}^2 \sum_{m=1}^N x_{i-1,m}^2 \right) \right] \right. \\ \left. (N-1)/(N-2) \right\}^{1/2} \quad (10)$$

in which:

$$x = X - \bar{X}$$

e. If there are insufficient simultaneous observations of any pair of variables to compute a required correlation coefficient, that value must be estimated. Each missing value is estimated by examining its relationship to related pairs of values in the current and preceding month by use of the following formula using i, j, and k subscripts to indicate variables used in the gross correlation.

$$R_{ij} = R_{ki} R_{kj} \pm \sqrt{(1 - R_{ki}^2)(1 - R_{kj}^2)} \quad (11)$$

Since, in order to be consistent with the two related correlation coefficients, the correlation coefficient must lie between the limits given by equation 11, the lowest upper limit and highest lower limit are established for all related pairs, and the average of these two limits is taken as the estimated correlation coefficient.

f. Monthly streamflows missing from the records of the various stations are estimated for all stations for each month in turn. Accordingly, whenever a missing flow is being reconstituted, there always exists a valid value for all stations already examined that month and for all remaining stations in either the current or preceding month. For these remaining stations, the current value is selected where available; otherwise the preceding value is used. In order to reconstitute the missing value, a regression equation in terms of normal standard variates is computed by selecting required coefficients from the complete correlation matrix for that month and solving by the Crout method (See exhibit 1). The missing value is computed from this regression equation, introducing a random component equal to the nondetermination of the equation, as discussed in the streamflow generation procedure.

g. It has been found that valid use of the regression technique requires that all correlation coefficients agree with the data that will be substituted into the equations and that the correlation coefficients be mutually consistent. Inconsistency in the correlation coefficients causes the dependent variable to be over-defined and is evidenced by a determination coefficient greater than 1.0. If this occurs (because of incomplete data), the independent variable contributing least to the correlation is dropped, and a new regression equation is computed. This process is repeated as necessary until consistency is reached (which must occur by the time that only one independent variable remains). In order to make the correlation matrix consistent with the data matrix, all affected correlation coefficients are recomputed after each estimate of missing data.

h. Normal standard deviates are then converted to flows by use of the following equations:

$$t_{i,m} = \left\{ \left[ (g_i/6)(K'_{i,m} - g_i/6) + 1 \right]^3 - 1 \right\}^{2/g_i} \quad (12)$$

$$X_{i,m} = \bar{X} + t_{i,m} S_i \quad (13)$$

$$Q_{i,m} = \text{Antilog } X_{i,m} - q_i \quad (14)$$

imposing the constraint:

$$Q_{i,m} \geq 0 \quad (15)$$

i. When the set of flows is complete, all correlation matrices should be consistent except for truncation errors in the computer, since the data arrays are complete. Any consistency of matrices obtained in this manner or of matrices read into the computer will result in determination coefficients greater than 1.0. If this occurs, consistency of each correlation matrix is assured by first testing all combinations of triads of correlation coefficients in the current and preceding month for all calendar months using equation 11 and raising the lowest of the three coefficients to obtain a consistent triad. The test of consistency of each complete matrix is made by recomputing the multiple correlation coefficient. If this value is greater than 1.0, further adjustment is required. Such further adjustment is obtained by introducing a coefficient, successively smaller by 0.2, on the radical in equation 11 and repeating all triad consistency tests until all matrices are consistent. If consistency is not reached, coefficients in each inconsistent matrix are moved toward the average value of all coefficients in that matrix until consistency is reached.

j. Generation of hypothetical streamflows is accomplished by computing a regression equation, by the Crout method (described in exhibit 1) for each station and month and then computing streamflows for each station in turn for one month at a time using the following equation. This process is started with average values (zero deviation) for all stations in the first month and discarding the first 2 years of generated flows.

$$K'_{i,j} = \beta_1 K'_{i,1} + \beta_2 K'_{i,2} + \dots + \beta_{j-1} K'_{i,j-1} + \beta_j K'_{i-1,j} + \beta_{j+1} K'_{i-1,j+1} + \dots + \beta_n K'_{i-1,n} + \sqrt{1-R_{i,j}^2} Z_{i,j} \quad (16)$$

in which:

- $K'$  = Monthly flow logarithm, expressed as a normal standard deviate
- $\beta$  = Beta coefficient computed from correlation matrix
- $i$  = Month number
- $j$  = Station number
- $n$  = Number of interrelated stations
- $R$  = Multiple correlation coefficient
- $Z$  = Random number from normal standard population

k. Maximum, minimum and average flows are obtained for the entire period of flows as recorded and for specified periods of reconstituted and generated flows by routine search technique.

1. Provision is also included in this program for use of the generalized model requiring only 4 generalized coefficients for each station (in place of 48) and one generalized correlation coefficient (in place of 12) for each pair of stations, in addition to identification of wet and dry seasons for each station. These are defined as follows:

(1) The average value of mean logarithms of flows for the wet season (3 months). This value plus 0.2 is applied to the middle month and the average minus 0.1 is applied to the other 2 months.

(2) The average value of mean logarithms of flows for the dry season (3 months). This is applied to all 3 dry months. Mean logarithms for months between dry and wet seasons are interpolated linearly.

(3) The average standard deviation for all 12 months. This is applied to each of the 12 months.

(4) The average serial correlation coefficient for all 12 months. This value minus .15 (but not less than zero) is applied to each wet-season month, and the value plus .15 (but not more than .98) is applied to each dry-season month. The average value is applied to all intermediate months.

(5) The average interstation correlation coefficient for all 12 months is applied to each month for that pair of stations.

m. Because of limitations in computer memory size and because of increasing change of computational instability with larger matrices, the number of stations usable simultaneously in this program has been limited to 10. However, the program can reconstitute and generate streamflows for

any number of stations in groups of 10 or less. It will ordinarily be desirable to include one or more stations from earlier groups in each successive group in order to preserve important correlations. In addition to providing flow data for all stations, it is necessary to designate NPASS and to follow each group of flow data with a standard-format card with NSTX (number of stations in next pass that were also used in preceding passes) and station identification numbers for those stations. These numbers must be listed in the same sequence as their data were arranged in earlier passes. Data for the new stations for the new pass should then be read. None of these flows can occur in a year later than the latest year for which flow data occurred in the first pass.

n. As soon as flows are reconstituted for any pass, they are read onto the flow tape. After statistics are computed from transformed reconstituted flows, they are read onto the statistics tape (after identification of stations in the pass for future reference). Final regression equation data for each pass are read onto the same tape at the same time (for use in generation later). For each new pass, the flow and statistics tapes are searched separately for data for those stations already used that also occur in the new pass. In order to read and write intermittently and alternatively on the same tapes, it is necessary to keep track of tape records so as to assure that any read statement does not read beyond the record mark and so that new write statements occur at the end of all previous write statements that are to be saved.

o. Once that statistics are put on tape, they are retained throughout the reconstitution and generation processes. Flows, however, are saved only for the set of data in which they were reconstituted or generated, until the last pass for that set is completed. In the generation process, it is necessary to save the last flow generated for each station in one set for use as the antecedent flow in starting generation in the next set. These are saved in the QSTAP array with subscript ISTAP.

## 5. INPUT

Input is summarized in exhibits 7 and 8. Data are entered consecutively on each card using a simple variety of formats to simplify punching and handling cards. Computed and generated flows cannot be 1,000,000 units or larger, and consequently must be expressed in units that cannot exceed this magnitude. Units should be indicated on one of the 3 header cards. Column 1 of each card is reserved for card identification. These are ignored by the computer except for the A in column 1 of the first header card, which is used to identify the first data card. An example of input is given in exhibit 3. Certain inadequacies of data will abort the job and waste input cards until the next card with A in column 1 is reached. A card with A in column 1 followed by 4 blank cards causes the computer to stop.

## 6. OUTPUT

Printed output includes key input information for job identification and all results of computations. Generated flows are put on magnetic tape, and computed statistics are punched on cards in the format usable later by the program. An example of printed output is given in exhibit 4.

## 7. OPERATING INSTRUCTIONS

Standard FORTRAN IV instructions and random number generator are required. No sense switches are used.

## 8. DEFINITIONS OF TERMS

Terms used in the program are defined in exhibit 5.

## 9. PROPOSED FUTURE DEVELOPMENT

There are cases where the model used herein does not reproduce historical droughts with reasonable frequency. Consequently, the model is under continuous study and development. It is requested that any user who finds an inadequacy or desirable addition or modification notify The Hydrologic Engineering Center.

EXHIBIT 1  
DETAILED EXPLANATION  
OF  
COMPUTER PROGRAM

GENERAL

Much of the program is explained by comment cards and definitions of variables. Supplementary explanation follows, referring to sections identified with the indicated letter in column 2 of a comment card.

SECTION A

Correlation coefficients, R, and beta coefficients, B, are in double precision for matrix inversion computation, in order to minimize computational instability. Correlation coefficient, RA, as originally computed and stored, may be defined in single precision. For computers with word length smaller than 32 bits, many other variables in this program should be in double precision.

When dimensions are changed, the corresponding variable (starting with K) should be changed accordingly, as these are used to prevent exceedence of dimensions. If an excessive subscript is used, the job will be dumped until a card with A in column 1 is encountered, at which time a new job is automatically started. If 5 blank cards (with an A in column 1 of the first) are encountered, the run will be terminated. Job specification cards are read in this section.

SECTION B

NSTAX is number of columns in correlation matrix. These consist of NSTA columns for the current-month values and a similar number for antecedent-month values. NSTAA is initial column number for antecedent-month coefficients. These are computed from NSTA, which is read in if statistics are to be provided, rather than computed from raw data. If raw data are to be used, NSTA is defined in the program later and NSTAA and NSTA must be also. Data for each new pass are processed after transferring back to statement 42. In the multipass operation, NSTX is the number of stations used from previous passes and NSTXX is the subscript of the first new station for the current pass. Station identification for the NSTX stations must be in the order in which data for those stations were originally used, because search of data and statistics on tape is made in this order. Flows for these stations are read from tape IQTAP, and corresponding statistics from tape ISTAT. Variables LQIAP and LSTAT are used to keep track of tape position for subsequent writing.

\*Provided through the cooperation of the Texas Water Development Board.

Months are identified consecutively by the variable M starting with the month preceeding the first year of data. Some quantities to be accumulated are initialized. Station combination data are stored for the purpose of obtaining maximums and minimums (section D) of weighted flow values later. Tandem stations are identified for cases where a check on consistency of generated quantities is deemed appropriate. Station identification numbers are set to a large number so they will not be undefined. The flow array is filled with -1 values to indicate missing values. For each station and calendar month, the total flow and number of recorded values are computed for computing a flow increment and other statistics later. The minimum flow for each station month is also computed in order to avoid negative logarithms later.

#### SECTION C

Station data can be read in random order. Stations are identified by subscript in the order in which data for each station are first read. The year subscript is computed. Negative subscripts will occur if data are for years earlier than the starting year indicated on B card, and data for these are rejected, with diagnostic printout. The stations are counted and the flows for each month at each station are counted for the purpose of computing frequency statistics later. If the number of stations or years exceeds its dimension limit, the job is aborted. The number of stations is permanently stored in the NSTNP array for later identification in multipass operations. The remainder of this section is self explanatory, except to state that permanent identification station numbers are given for stations in combination, for tandem stations, and for consistency-test stations, and subscripts are identified for rapid computation later.

#### SECTION D

In this section, maximum and minimum recorded flows for each calendar month, the water year and for durations of 1, 6, and 54 months, and average flows are computed for each station and combination. Durations do not span a break in any record. Quantities are rounded off and printed in fixed-point format.

#### SECTION E

The logarithm transform of flows is accomplished here. Missing values are indicated by an impossibly large number (the -1 used for missing flows is a reasonable logarithm and therefore cannot be used for missing logarithms). Before the log transform, the average flow for each calendar month at each station is computed and one (constrained to a minimum of 0.1 flow unit) is added to each flow. If the minimum observed flow for that station month is negative, that absolute value



is also added before the transform. After the logarithm transform, frequency statistics for each calendar month and station are computed. An increment needed to convert the logarithms to an approximately normal distribution is also computed as an alternative future transform. Logarithms to the base 10 are used so that statistics are comparable to other commonly used statistics. A variable IRCON is set to 1 if any missing values are encountered, so that the flow reconstitution routine will be called later. A variable INDC is set to 1 if the first approximation of increments causes any one of the skew coefficients to be smaller than 0.1 or larger than 0.1. In an optional routine that follows, the increment for each station and calendar month is adjusted individually and iteratively (up to 14 trials) until skew is within 0.1 of zero.

Stations with less than three years of data for any calendar month are deleted, since skew and correlation computations require at least three items of data.

## SECTION F

Correlation matrices are computed here for the purpose of adjusting frequency statistics for short-record stations. All correlation coefficients are first set to -4.0 in order to identify those not computed later for lack of sufficient observed data. Then accumulations of the various quantities required are computed for all items above the main diagonal in the correlation matrix for each month, using all data common to the two stations involved. If more than two items of data are available, the correlation coefficients are computed. Coefficients for the main diagonal are set to 1.0, and those below the main diagonal are set equal to their symmetrical element. Coefficients between the current and preceding month's values are similarly computed. These items constitute an extension of the matrix to the right, which doubles its size, and the new portion is not necessarily symmetrical. Similar complete arrays of average values and root-mean-square values for only those logarithms common to each pair of stations are found for later use in adjusting statistics.

A search is then made to determine the station that would be most useful in adjusting statistics for station months with incomplete record, and the means and standard deviations are adjusted in accordance with the following equations:

$$S'_1 = S_1 + (S'_2 - S_2) R^2 S_1 / S_2$$

$$\bar{X}'_1 = \bar{X}_1 + (\bar{X}'_2 - \bar{X}_2) RS_1 / S_2$$

where primes indicate long-period values, subscripts are 1 for the short-record station and 2 for the long-record station and,

$\bar{X}$  = mean logarithm

S = standard deviation of the logarithms

R = correlation coefficient.

An optional check of consistency of standard deviations between adjacent stations for the same month is next made. This is to assure that frequency curves do not cross within three standard deviations from the mean. If there is a conflict, the standard deviation of that station designated in the input data as the dependent variable is modified accordingly. All frequency statistics are then printed out.

#### SECTION G

All flows are next standardized by subtracting the mean and dividing by the standard deviation for the month and station. An approximate Pearson Type III transform is then applied as follows:

$$K = 6 \left[ (.5 gt + 1)^{1/3} - 1 \right] / g + g/6$$

where:

K = normal standard deviate  
t = Pearson Type III standard deviate  
g = skew coefficient

New correlation matrices are then computed, based on the normalized variates and using the same standard procedures previously employed for correlating logarithms. The sign of the correlation coefficient is preserved, since the coefficient will be used to establish regression equations. Correlation coefficients are set to zero if the variance of either variable approximates zero, since the computation of the coefficient is highly unstable and since its use would be of little value.

#### SECTION H

For jobs where correlation data are given, the portion of the correlation matrix above the main diagonal for all months and the entire correlation matrix relating current and preceding month's values are read, with a different card for each pair of stations. Values for all 12 months are contained on one card, and the two stations involved are identified on the same card. An automatic check is made to assure that cards are in the required order of columns and rows in the correlation matrix. When generalized statistics are used, only one correlation coefficient for the entire year is read, but card order is the same. Symmetrical elements below the main diagonal are then filled in and values of 1.0 are placed in the main diagonal.

Frequency statistics are then read, 4 cards per station, with 12 monthly values and station identifications on each card. A check is made of the station order, to assure proper subscripting. When generalized statistics are used, only one card per station is read, and this contains the maximum and minimum mean logarithms and the average standard deviation for the year. The months of maximum and minimum mean logarithms are also read and converted to corresponding subscripts. These subscripts will differ from the calendar month number if the year used in the study does not begin with January.

## SECTION I

This section searches for each calendar month the entire correlation matrix to be the right of the main diagonal for missing correlation coefficients due to the nonexistence of at least three years of simultaneous data for the month. As soon as a coefficient between two variables is identified as missing, a search of the correlation matrix is made to find established correlation coefficients between each of these variables (i and j) and any other variable (k). The range within which correlation between the two variables must lie in order to be mathematically consistent with the correlation with the third variable is established by use of the following equation:

$$R_{ij} = R_{ki} R_{kj} \pm \sqrt{(1-R_{ki}^2)(1-R_{kj}^2)}$$

As each successive third variable with established correlation coefficients is found, the upper limit of  $R_{ij}$  is constrained to the lowest of all upper limits computed, and the lower limit is constrained to the highest of all such lower limits computed. When the entire matrix has been searched the correlation coefficient is estimated as the average of these two constrained limits. If this element is above the main diagonal, the value is also entered for the element symmetrically across the main diagonal. The search for further missing correlation coefficients is then continued.

## SECTION J

Where a correlation matrix is not to be used for reconstituting data but might be inconsistent, a triad consistency test can be made in this section. This is done by examining all groups of three related correlation coefficients, and testing the lowest one to determine whether it is above minimum constraint established by the equation in the preceding station. If not, it is raised to that minimum. When this is done, it is possible that the adjusted coefficient had already been used in another triad test, and consequently that previous test would need to be repeated. In order to do this properly, the entire matrix is searched up to 12 NSTA times, where NSTA is the number of stations, until a complete search reveals no inconsistent triad (INDC = 0).

A coefficient FAC of the radical in the equation is used in order to obtain complete matrix consistency in difficult cases, whenever possible by this means. A test for overall consistency is made in section K, and if this fails, FAC is successively reduced by 0.2 until overall consistency is reached.

#### SECTION K

The test for overall consistency of the correlation matrix for each month is made by constructing for each station the correlation matrix that would be used in flow generation for that station and computing the multiple determination coefficient. If the determination coefficient of the matrix for any station and any month exceeds 1.0, all correlation matrices must be reexamined, since some coefficients are common to two or more matrices. This is done by reducing FAC in the triad test (section J) by 0.2 and repeating all triad tests. If FAC is reduced to zero and consistency is not obtained, an index of NCB is set to 1 and an averaging routine is used for each inconsistent matrix. A quantity SUM is computed as the average of all correlation coefficients in that matrix, and each element is modified by multiplying SUM by the excess of determination coefficient and adding this product to the product of the complement of this multiplier and the value of the element in the inconsistent matrix. The averaged or smoothed values are replaced in the complete matrix for the month, and this requires some careful manipulation of subscripts. A new computation of determination coefficient is made and the smoothing process is repeated up to nine times until consistency prevails. If this does not occur, the job is terminated. When consistency is established all complete matrices are printed out and essential elements are punched if desired.

#### SECTION L

In reconstituting missing data, a search is made for each month of record starting with the first for stations that have no record during that month ( $Q=T$ ). When one is found, a search of all other stations is made to determine whether recorded or previously reconstituted flows exist for the current month or, if not, for the preceding month. If one is found, it will constitute an independent variable for estimating the missing value, and its value and pertinent correlation coefficients are stored in new arrays for computation purposes. The correlation coefficients with the dependent variable is temporarily stored in the NVAR (NSTA+1) column to assure that coefficients relating independent variables which have sufficient array space (they cannot exceed NSTA in number). A variable ITEMP counts the number of independent variables (stations for which recorded or reconstituted data are available). It is incremented after its set of correlation coefficients are stored in the R array, and is finally used to relocate the correlation coefficients involving the dependent variable. If no independent variables with data

are found, as can happen in the first month of record, a correlation is made with the preceding value for the same station and that preceding value is arbitrarily set at the average for the month. The regression equation and determination coefficient are then computed using subroutine CROUT. The variable having the lowest absolute value of correlation with the dependent variable is identified, and beta coefficients are searched in order to eliminate all unreasonable coefficients. In the usual case where the simple correlation coefficient between any variable and the dependent variable is positive, unreasonable coefficients are assumed to be those larger than 1.5 or smaller than -.5. In the case where the variable correlates negatively with the dependent variable, the reasonable range is -1.5 to 0.5. If an unacceptable coefficient is found, INDC is set to 1. If this happens or if the determination coefficient does not lie between 0 and 1.0, the variable with the smallest correlation coefficient is eliminated, the correlation array reconstructed accordingly, and the regression equation recomputed. This process is repeated until all required conditions exist. The missing value is then computed by use of the regression equation and adding a random component normally distributed with zero mean and with variance equal to the error variance of the regression equation.

As soon as the missing value is estimated a search is made for all established values in the current and preceding month with which it is to be correlated, and sums of logarithms, squares, and cross products are incremented in preparation for recomputing all affected correlation coefficients. After checking for sufficient (three years) record and nonzero variance, the correlation coefficient is recomputed. If the standard deviation of either variable is very small, the correlation coefficient is set to zero. If the coefficient is above the main diagonal of the correlation matrix, its value is also assigned to symmetrical element. Since estimation of a missing value affects correlation coefficients between variables in the current and following month, which coefficients are stored in a different matrix, this process of adjusting the correlation coefficient is applied to those values next.

#### SECTION M

After all flows are reconstituted, the flow tape is read until the proper position for writing the newly computed flow data on that tape is reached, and headings are printed for writing flows on the printer later. Then the standard deviates are converted to flows by reversing the Pearson type III transform, multiplying by the standard deviation, adding to the mean and taking the antilogarithm. The increment is then subtracted and if the resulting value is negative for a variable with zero lower limit, it is set to zero. In the case of reconstituted flows, the Pearson Type III transform is constrained so that the excess of the standard deviate over and above 2.0 is multiplied by a maximum of 0.3 (if the standard

diviation exceeds 0.3). This simply prevents obtaining unreasonably extreme values due to sampling errors. It is a moderation of the extrapolation rather than an abrupt truncation.

The test for tandem station consistency is next made, and inconsistent flows are identified for printout and changed to the limit of consistency. The downstream flow is made consistent with the sum of upstream flows. Flows are punched on cards, if desired, printed out, and written on the flow tape for use in future passes. NQTAP is incremented and represents the total number of records on the tape.

#### SECTION N

After converting deviates to flows, the frequency statistics are recomputed in order to agree accurately with observed and reconstituted data. If a consistency test is called for, the variable ITRNS is set to 2 and computation is transferred to near the end of section F, where the test is made and the transfer index causes a return to this portion of the program. Adjusted statistics are printed, and the consistent correlation matrix is printed (and, if desired, also punched) by transfer to section K, using ITRNS as a return indicator again. The statistics are then punched, if desired. Flows for the specified station combinations are then computed.

#### SECTION O

Maximum and minimum recorded flows are computed by transfer to section S, using ITRNS=1 as a return indicator. The variable ITMP keeps a record of the remaining years whose maximum and minimum flows have not been searched yet.

Next, generalized statistics are computed, if desired, (if IGNRL equals two). As indicated, straight averages of all 12 monthly correlation coefficients in every category are taken. Means are averaged for the three wettest consecutive months and the three driest consecutive months and the seasonal timing noted. Standard deviations for all 12 months are averaged. Generalized statistics are then printed out.

Next, generalized statistics read in section H are used to compute required arrays of statistics. Skew and increments are set to zero. The mean for the middle month of the wet season is .2 higher than the wet season average and means for the other two months are .1 lower. Means for the dry seasons are uniform, and means for the transition seasons are interpolated linearly. Correlation coefficients for the dry season are .15 higher (constrained below .98) than the annual average, and those for the wet season are .15 low (constrained above zero). All of these operations are in accord with the generalized model developed in HEC.

## SECTION P

After obtaining monthly statistics and correlation matrices, regression equations for each station and calendar month are computed. Flows are generated in the station order in which data or statistics are read and are generated for each month at all stations before proceeding to the next month. Flows at each station are correlated with flows of the antecedent month at that station and at all stations for which the current month's flows have not yet been generated. For other stations, flows for the current month are used.

Regression equations are computed in subroutine CROUT. If any correlation matrix formed is inconsistent (which should not occur at this stage, except for truncation of computed intermediate variables), a transfer to section J is effected, and consistency operations performed on all correlation matrices. After such a transfer, all regression equations must be recomputed, since any correlation coefficient might have changed. After this, only the beta and alienation coefficients need be retained, in addition to the frequency statistics. In the multipass operation, these are all written on tape ISTST at this point.

## SECTION Q

A routine for projecting historical sequences into the future is employed here. Values of QPREV (previous month's deviate) for each station is determined as the transform of the flow for the month preceding the first month specified (by input data) to be generated. The variable MA is computed for the subscript of Q that conforms to the first month of projected flows. If the projected flow routine is not to be used, the computer is next set up to generate two years of flows, at the end of which synthetic sequences will have a virtually random start.

In the multipass operation, stations are identified and all necessary statistics are contained in the order needed on tape ISTAT. In any pass after the first, flows generated in earlier passes for the same period (the same sequence of data) must be read from tape IQTAP, and this tape must be rewound before each pass in order to permit a complete search. In any sequence after the first, the preceding flow for the first month to be generated is the last flow in the preceding sequence for that station, and these are saved in the QSTAP array for multipass operation. If the multipass feature is not used, all necessary statistics and flows for generating are in memory.

## SECTION R

In starting to generate flows, a variable JXTMP is used to identify the year number of the first year of each sequence in the multipass

operation. Variables AVG and SDV are used to compute the mean and standard deviation of the deviates for each flow sequence. These are later used to adjust all deviates so that the means and standard deviations in every generated sequence will be the same as those of the historical sequence.

Variables JA and NJ are set up to correspond to the first and last year of generation in each successive sequence, depending on the type of operation. MA has already been set up as the subscript of Q corresponding to the first month of flows to be generated (for use in projecting historical flows recorded to the current time). QPREV for each station has been identified as the previous month's flow for that station. Flows are then generated for each station, using stored regression equations and a random component. Each generated flow is immediately entered into the QPREV array, because its preceding flow will never again be used in that pass.

In the multipass routine, flows (as deviates) are written on tape at the end of each pass, and the last flow for each station is stored in the QSTAP array for use in the next sequence.

If more than 19 years (an arbitrarily selected length) of flow are being generated in any sequence, deviates are adjusted so that their mean is zero and variance 1.0. Their unadjusted mean and standard deviation are printed. Then they are transformed to flows, and, if called for, consistency tests between stations are made. For variables with zero natural limit, a check for negative values is then made. Flows are then printed and, if desired, punched. Flow combinations are then computed.

## SECTION S

Before computing maximum and minimum values of generated flows, a positive value of JX is looked for to assure that flows generated are not to be discarded (the first two years generated for a random start). Also, at least NYMXG years must have been generated before maximum and minimum values are computed (this applies only when the number of years remaining for generation in the last sequence does not equal NYMXG). Maximum sums are initiated at an extremely large negative number and minimum sums as an extremely large positive number (T). Then a routine search of flow sums for the specified durations at each station is made for the sequence, and results are printed out. Since this routine is used for reconstituted flows as well as for generated flows, a transfer indicator is used to determine whether the next step is back to the reconstitution routine or the generation routine. If the latter, a check is made for the multipass routine. If all passes are not completed, a transfer to section Q is made. If all passes are completed for this sequence or if the multipass routine is not being



used, a check is made of remaining years to be generated. If greater than zero, a transfer to section Q is made after adjusting years yet to be generated. Otherwise the job is ended and a new job, if any, is started.

#### RANDOM NUMBER FUNCTION RNGEN

This random number function is for a binary machine and the constants must be computed according to the number of bits in an integer word. The numbers generated are uniformly distributed in the interval 0 to 1.

The function is called from the main program by a statement similar to the following:

A = RNGEN (IX)

Where A is some floating point variable name and IX is some integer variable name. The argument name IX need not be the same in the main program and the function. The argument must be initialized to zero in the main program. The location of the initializing statement is important and depends on the results desired. If it is desired to have different sets of random numbers for each of several different sets of computations (jobs) that are run sequentially on the same program, then the argument must be initialized at the very beginning of the program and never reinitialized. If it is permissible to use the same sequence of random numbers for each job, the argument must be initialized at the beginning of each job. The advantage of this latter option occurs when one of the jobs must be re-run for some minor reason as the same random numbers will be used and the results will be comparable.

Three constants must be computed by the following equations:

$$\text{Constant one (C1)} = 2^{(B+1)/2} + 3$$

$$\text{Constant two (C2)} = 2^B - 1$$

$$\text{Constant three (C3)} = 1./2.^B$$

Where: B = number of bits in an integer word

The constants for some of the common computers are listed in the following table:

COMPUTER	SIZE OF INTEGER WORD	CONSTANTS		
		C1	C2	C3
GE 200 Series	19	1027	524287	0.190734863E-05
GE 400 Series	23	4099	8388607	0.119209290E-06
IBM 360 Series	31	65539	2147483647	0.465661287E-09
IBM 7040 and 7090 Series	35	262147	34359738367	0.2910383046E-10
UNIVAC 1108	"	"	"	"
CDC 6000 Series	48	16777219	281474976710655	0.3552713678E-14



April 1960

EXHIBIT 2  
Crout's Method

One of the best methods for solving systems of linear equations on desk calculating machines was developed by P. D. Crout in 1941. This method is based on the elimination method, with the calculations arranged in systematic order so as to facilitate their accomplishment on a desk calculator. In this method the coefficients and constant terms of the equations are written in the form of a "matrix," which is a rectangular array of quantities arranged in rows and columns.

The method is best explained by an example. Suppose that in a multiple correlation analysis it is required to solve the following system of linear equations to obtain the unknown values of  $b_2$ ,  $b_3$ ,  $b_4$  and  $b_5$ .

$$\Sigma x_2^2 b_2 + \Sigma x_2 x_3 b_3 + \Sigma x_2 x_4 b_4 + \Sigma x_2 x_5 b_5 = \Sigma x_1 x_2$$

$$\Sigma x_2 x_3 b_2 + \Sigma x_3^2 b_3 + \Sigma x_3 x_4 b_4 + \Sigma x_3 x_5 b_5 = \Sigma x_1 x_3$$

$$\Sigma x_2 x_4 b_2 + \Sigma x_3 x_4 b_3 + \Sigma x_4^2 b_4 + \Sigma x_4 x_5 b_5 = \Sigma x_1 x_4$$

$$\Sigma x_2 x_5 b_2 + \Sigma x_3 x_5 b_3 + \Sigma x_4 x_5 b_4 + \Sigma x_5^2 b_5 = \Sigma x_1 x_5$$

For simplicity let us replace the coefficients of the  $b$ 's by the letters  $p$ ,  $q$ ,  $r$  and  $s$ , and the constant terms by the letter  $t$ , using subscripts 1, 2, 3 and 4 to denote the respective equations.

$$p_1 b_2 + q_1 b_3 + r_1 b_4 + s_1 b_5 = t_1$$

$$p_2 b_2 + q_2 b_3 + r_2 b_4 + s_2 b_5 = t_2$$

$$p_3 b_2 + q_3 b_3 + r_3 b_4 + s_3 b_5 = t_3$$

$$p_4 b_2 + q_4 b_3 + r_4 b_4 + s_4 b_5 = t_4$$

A continuous check on the computations as they progress may be obtained by adding to the matrix of the above system a column of  $u$ 's, such that  $u = p + q + r + s + t$ . The matrix and check column are written as follows:

EXHIBIT 2

$$\begin{vmatrix} p_1 & q_1 & r_1 & s_1 & t_1 & u_1 \\ & p_2 & q_2 & r_2 & s_2 & t_2 & u_2 \\ & & p_3 & q_3 & r_3 & s_3 & t_3 & u_3 \\ & & & p_4 & q_4 & r_4 & s_4 & t_4 & u_4 \end{vmatrix}$$

The elements  $p_1, q_2, r_3$  and  $s_4$  form the "principal diagonal" of the matrix. Examination of the original equations shows that the coefficients are symmetrical about the principal diagonal, i.e.,  $q_1 = p_2, r_1 = p_3, r_2 = q_3, s_1 = p_4, s_2 = q_4$ , and  $s_3 = r_4$ . This is characteristic of the system of equations to be solved in any multiple correlation analysis. Because of this symmetry, the computations are considerably simplified. While the Crout method may be used to solve any system of linear equations, the computational steps given here are applicable only to those with symmetrical coefficients.

The solution consists of two parts, viz., the computation of a "derived matrix" and the "back solution." Let the derived matrix be denoted as follows:

$$\begin{vmatrix} P_1 & Q_1 & R_1 & S_1 & T_1 & U_1 \\ & P_2 & Q_2 & R_2 & S_2 & T_2 & U_2 \\ & & P_3 & Q_3 & R_3 & S_3 & T_3 & U_3 \\ & & & P_4 & Q_4 & R_4 & S_4 & T_4 & U_4 \end{vmatrix}$$

The elements of the derived matrix are computed as follows:

$$P_1 = p_1 \quad P_2 = p_2 \quad P_3 = p_3 \quad P_4 = p_4$$

$$Q_1 = \frac{q_1}{p_1} \quad R_1 = \frac{r_1}{p_1} \quad S_1 = \frac{s_1}{p_1} \quad T_1 = \frac{t_1}{p_1} \quad U_1 = \frac{u_1}{p_1}$$

$$Q_2 = q_2 - P_2 Q_1 \quad Q_3 = q_3 - P_3 Q_1 \quad R_2 = \frac{Q_3}{Q_2}$$

$$Q_4 = q_4 - P_4 Q_1 \quad S_2 = \frac{Q_4}{Q_2} \quad T_2 = \frac{t_2 - T_1 P_2}{Q_2} \quad U_2 = \frac{u_2 - U_1 P_2}{Q_2}$$

$$R_3 = r_3 - Q_3 R_2 - P_3 R_1 \quad R_4 = r_4 - Q_4 R_2 - P_4 R_1 \quad S_3 = \frac{R_4}{R_3}$$

$$T_3 = \frac{t_3 - T_2 Q_3 - T_1 P_3}{R_3} \quad U_3 = \frac{u_3 - U_2 Q_3 - U_1 P_3}{R_3}$$

$$S_4 = s_4 - R_4 S_3 - Q_4 S_2 - P_4 S_1$$

$$T_4 = \frac{t_4 - T_3 R_4 - T_2 Q_4 - T_1 P_4}{S_4} \quad U_4 = \frac{u_4 - U_3 R_4 - U_2 Q_4 - U_1 P_4}{S_4}$$

The general pattern of the above computations, which may be applied to a system containing any number of equations, is as follows:

- (1) The first column of the derived matrix is copied from the first column of the given matrix.
- (2) The remaining elements in the first row of the derived matrix are computed by dividing the corresponding elements in the first row of the given matrix by the first element in that row.
- (3) After completing the  $n^{\text{th}}$  row, the remaining elements in the  $(n+1)^{\text{th}}$  column are computed. Such an element (X) equals the corresponding element of the given matrix minus the product of the element immediately to the left of (X) by the element immediately above the principal diagonal in the same column as (X), minus the product of the second element to the left of (X) by the second element above the principal diagonal in the same column as (X), etc. After each element below the principal diagonal is recorded, and while that element is still in the calculator, it is divided by the element of the principal diagonal which is in the same column. The quotient is the element whose location is symmetrical to (X) with respect to the principal diagonal.

(4) When the elements in the  $(n+1)^{\text{th}}$  column and their symmetrical counterparts have been recorded, the  $(n+1)^{\text{th}}$  row will be complete except for the last two elements, which are next computed. Such an element (X) equals the corresponding element of the given matrix minus the product of the element immediately above (X) by the element immediately to the left of the principal diagonal in the same row as (X), minus the product of the second element above (X) by the second element to the left of the principal diagonal in the same row as (X), etc., all divided by the element of the principal diagonal in the same row as (X).

The check column (U) of the derived matrix serves as a continuous check on the computations in that each element in the column equals one plus the sum of the elements in the same row to the right of the principal diagonal. That is,

$$U_1 = 1 + Q_1 + R_1 + S_1 + T_1$$

$$U_2 = 1 + R_2 + S_2 + T_2$$

$$U_3 = 1 + S_3 + T_3$$

$$U_4 = 1 + T_4$$

This check should be made after completing each row.

The elements of the derived matrix to the right of the principal diagonal form a system of equations which may now be used to compute the unknown values of  $b_2$ ,  $b_3$ ,  $b_4$  and  $b_5$  by successive substitution.

This is known as the "back solution." The computations are as follows:

$$b_5 = T_4$$

$$b_4 = T_3 - S_3 b_5$$

$$b_3 = T_2 - S_2 b_5 - R_2 b_4$$

$$b_2 = T_1 - S_1 b_5 - R_1 b_4 - Q_1 b_3$$

It is very important that the computations be carried to a sufficient number of digits, both in computing the coefficients and constant terms of the original equations, and in computing the elements of the derived matrix. It is possible for relatively small errors in the coefficients and constant terms of the original equations to result in relatively large errors in the computed solutions of the unknowns. The

greatest source of error in computing the elements of the derived matrix arises from the loss of leading significant digits by subtraction. This must be guarded against and can be done by carrying the computations to more figures than the data. As a general rule, it is recommended that the coefficients and constant terms of the original equations be carried to a sufficient number of decimals to produce at least five significant digits in the smallest quantity, and that the elements of the derived matrix be carried to one more decimal than this, but to not less than six significant digits.





TEST DATA - 723-X6-L2340  
MONTHLY STREAMFLOW SIMULATION - NOV 1970  
STANDARD ANALYSIS AND GENERATION

	10	5	10	5	1
A 1904	10	5	10	5	1
A 1	107	110	111		
A 3	1.	1.	1.		
A 3	4.64	2.24	3.74	9.72	30.2
H1071905	.372	1.35	2.25	33.2	16.7
H1071906	.867	1.98	31.4	72.6	32.5
H1071907	2.72	4.08	3.38	3.65	13.2
H1101904	33.5	6.49	5.50	6.89	14.0
H1101905	2.59	3.31	5.04	48.9	23.1
H1101906	6.40	6.07	14.1	25.6	33.4
H1101907	7.07	6.37	12.3	12.8	18.8
H1101908	12.4	13.9	13.1	12.5	37.4
H1111904	119.	37.7	22.6	28.1	50.8
H1111905	11.2	12.1	16.3	146.	68.3
H1111906	31.4	23.4	43.0	87.9	101.
H1111907					
I					

.553 .085  
1.09 .400  
1.19 1.15  
6.76 7.14  
4.52 2.61  
42.6 12.3  
16.1 5.60  
5.44 5.01  
65.2 42.7  
28.3 12.6  
270. 67.2  
121. 32.5

1.48  
3.24  
2.80  
14.1  
18.4  
216.  
64.6  
11.4  
123.  
116.  
1000.  
454.

4.36  
10.7  
6.49  
70.2  
82.7  
288.  
124.  
36.2  
431.  
386.  
1010.  
625.

14.8  
18.3  
12.2  
141.  
88.5  
200.  
122.  
55.5  
590.  
366.  
682.  
563.

13.8  
33.1  
32.4  
62.5  
47.5  
110.  
118.  
48.0  
212.  
165.  
287.  
403.

TEST DATA - 723-X6-L2340  
MONTHLY STREAMFLOW SIMULATION - NOV 1970  
MULTI-PASS RECONSTITUTION AND GENERATION

	10	5	10	5	2
A 1904	10	5	10	5	2
A 1	107	110	111		
A 3	1.	1.	1.		
A 3	4.64	2.24	3.74	9.72	30.2
H1071905	.372	1.35	2.25	33.2	16.7
H1071906	.867	1.98	31.4	72.6	32.5
H1071907	2.72	4.08	3.38	3.65	13.2
H1101904	33.5	6.49	5.50	6.89	14.0
H1101905	2.59	3.31	5.04	48.9	23.1
H1101906	6.40	6.07	14.1	25.6	33.4
H1101907	7.07	6.37	12.3	12.8	18.8
H1101908	12.4	13.9	13.1	12.5	37.4
H1111904	119.	37.7	22.6	28.1	50.8
H1111905	11.2	12.1	16.3	146.	68.3
H1111906	31.4	23.4	43.0	87.9	101.
H1111907					
I					

.553 .085  
1.09 .400  
1.19 1.15  
6.76 7.14  
4.52 2.61  
42.6 12.3  
16.1 5.60  
5.44 5.01

1.48  
3.24  
2.80  
14.1  
18.4  
216.  
64.6  
11.4  
123.  
116.  
1000.  
454.

4.36  
10.7  
6.49  
70.2  
82.7  
288.  
124.  
36.2  
431.  
386.  
1010.  
625.

14.8  
18.3  
12.2  
141.  
88.5  
200.  
122.  
55.5  
590.  
366.  
682.  
563.

13.8  
33.1  
32.4  
62.5  
47.5  
110.  
118.  
48.0  
212.  
165.  
287.  
403.

TEST DATA - 723-X6-L2340												
MONTHLY STREAMFLOW SIMULATION - NOV 1970												
FLOW PROJECTIONS												
	10	1	5	2	1909	10	1913					
H1101904	2.72	4.08	3.38	3.65	13.2	46.7	62.5	141.	70.2	14.1	6.76	7.14
H1101905	37.5	6.49	5.50	6.89	14.0	34.4	47.5	88.5	82.7	18.4	4.52	2.61
H1101906	2.59	3.31	5.04	48.9	23.1	152.	110.	200.	288.	216.	42.6	12.3
H1101907	6.40	6.07	14.1	25.6	33.4	64.0	118.	122.	124.	64.6	16.1	5.60
H1101908	7.07	6.37	12.3	12.8	18.8	37.1	48.0	55.5	36.2	11.4	5.44	5.01
H1111904	12.4	13.9	13.1	12.5	37.4	134.	212.	590.	431.	123.	65.2	42.7
H1111905	119.	37.7	22.6	28.1	50.8	116.	165.	366.	386.	116.	28.3	12.6
H1111906	11.2	12.1	16.3	146.	68.3	330.	287.	682.	1010.	1000.	270.	67.2
H1111907	31.4	23.4	43.0	87.9	101.	248.	403.	563.	625.	454.	121.	-1

TEST DATA - 723-X6-L2340												
MONTHLY STREAMFLOW SIMULATION - NOV 1970												
COMPUTE AND USE GENERALIZED STATISTICS												
	10	1	5	2	10	10	10	1				
H1101904	2.72	4.08	3.38	3.65	13.2	46.7	62.5	141.	70.2	14.1	6.76	7.14
H1101905	33.5	6.49	5.50	6.89	14.0	34.4	47.5	88.5	82.7	18.4	4.52	2.61
H1101906	2.59	3.31	5.04	48.9	23.1	152.	110.	200.	288.	216.	42.6	12.3
H1101907	6.40	6.07	14.1	25.6	33.4	64.0	118.	122.	124.	64.6	16.1	5.60
H1101908	7.07	6.37	12.3	12.8	18.8	37.1	48.0	55.5	36.2	11.4	5.44	5.01
H1111904	12.4	13.9	13.1	12.5	37.4	134.	212.	590.	431.	123.	65.2	42.7
H1111905	119.	37.7	22.6	28.1	50.8	116.	165.	366.	386.	116.	28.3	12.6
H1111906	11.2	12.1	16.3	146.	68.3	330.	287.	682.	1010.	1000.	270.	67.2
H1111907	31.4	23.4	43.0	87.9	101.	248.	403.	563.	625.	454.	121.	32.5

TEST DATA - 723-X6-L2340												
MONTHLY STREAMFLOW SIMULATION - NOV 1970												
STATISTICS FURNISHED												
	10	10	10	10	10	10	10	10	10	10	10	3
107 107	.864	.949	.521	.402	.000	.000	.916	.000	.000	.947	.880	.897
107 110	.390	.951	.532	.407	.000	.999	.867	.000	.998	.936	.850	.754
107 111	.390	.956	.510	.392	0.	.967	.946	0.	.926	.955	.863	.769
110 107	.998	.979	.988	.793	.000	.770	.992	.000	.988	.965	.822	.596
110 107	.866	.928	.518	.317	.999	.000	.923	.833	.000	.983	.963	.729

110	110	.391	.930	.529	.321	.793	.757	.860	.826	.986	.971	.959	.833
110	111	.391	.936	.507	.309	.789	.733	.938	.763	.915	.975	.974	.850
111	107	.992	.979	.968	.784	.000	.866	.917	.000	.992	.980	.858	.591
111	110	.994	.957	.963	.995	.967	.917	.924	.924	.980	.985	.980	.998
111	107	.861	.970	.538	.315	.968	.000	.999	.906	.000	.968	.974	.728
111	110	.389	.971	.550	.319	.767	.826	.795	.899	.990	.956	.940	.832
111	111	.388	.977	.526	.307	.763	.799	.867	.831	.918	.974	.955	.849
107	107	.123	.277	.917	1.378	1.449	1.851	1.393	1.156	.778	.327	-.079	-.529
107	107	.509	.100	.651	.339	.151	.196	.154	.076	.176	.152	.138	.412
107	107	.015	-.027	.157	-.211	-.750	-.829	-.658	-.164	-.098	-.643	-.793	-.253
107	107	.0	.0	.1	.5	.3	1.0	.3	.2	.1	.0	.0	.0
110	110	.817	.712	.849	1.132	1.291	1.760	1.859	2.052	1.983	1.538	1.021	.768
110	110	.443	.131	.263	.437	.164	.259	.189	.208	.327	.528	.399	.241
110	110	.220	-.036	-.048	.150	.418	.586	.262	-.006	.236	.550	.464	.307
110	110	.1	.1	.1	.2	.2	.8	.9	1.5	1.4	.8	.2	.1
111	1.529	1.332	1.401	1.401	1.637	1.798	2.281	2.407	2.707	2.712	2.345	1.878	1.574
111	.451	.207	.242	.242	.416	.160	.184	.143	.118	.195	.469	.391	.283
111	.289	.505	.359	.359	.118	.073	.144	-.099	-.253	.125	.274	-.074	-.115
111	.5	.3	.3	.3	.8	.8	2.5	3.2	6.6	7.4	5.1	1.5	.5

A

A

A

B

C

TEST DATA - 723-X6-L2340  
MONTHLY STREAMFLOW SIMULATION - NOV 1970  
GENERALIZED STATISTICS FURNISHED

10

10

10

1

3

107 107 .531

110 107 .741

110 110 .763

111 107 .744

111 110 .965

111 111 .763

107 1.494 -.189 .290 4. 10.

110 1.965 .766 .299 6. 11.

111 2.611 1.427 .269 6. 12.

A



TEST DATA - 723-X6-L2340  
MONTHLY STREAMFLOW SIMULATION - NOV 1970  
STANDARD ANALYSIS AND GENERATION

IYRA IMNTH IANAL MXRCS NYRG NYMXG NPASS IPCHQ IPCHS NSTA NCOMB NTNDM NCSTY IGNRL NPROJ IYRPJ MTHPJ LYRPJ  
1904 10 1 5 10 5 1 1 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0

COMB 1 STA 3 107 110 111  
RATIO 1.000 1.000 1.000

MAXIMUM VOLUMES OF RECORDED FLOWS

STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV
107	10	11	12	1	2	3	4	5	6	7	8	9	1	6	54	AV
107	5	2	31	73	33	121	33	18	11	3	1	1	121	302	99999998	18
110	34	6	14	49	33	152	118	200	288	216	43	12	288	1009	2656	45
111	119	38	43	146	101	330	403	682	1010	1000	270	67	1010	3579	99999998	204
996	157	46	89	228	167	566	553	900	1309	1219	314	80	1309	4738	99999998	299

MINIMUM VOLUMES

STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV
107	10	11	12	1	2	3	4	5	6	7	8	9	1	6	54	AV
107	0	1	2	10	17	37	14	12	4	1	1	0	0	0	99999999	18
110	3	3	3	4	13	34	48	56	36	11	5	3	3	36	2519	45
111	11	12	13	13	37	116	165	366	386	116	28	13	11	196	99999999	204
996	14	17	24	45	95	187	226	469	473	136	33	15	14	239	99999999	299

FREQUENCY STATISTICS

STA	ITEM	10	11	12	1	2	3	4	5	6	7	8	9
107	MEAN	.112	.283	.820	1.465	1.410	1.862	1.395	1.177	.834	.395	.000	-.312
107	STD DEV	.513	.108	.597	.433	.157	.263	.214	.087	.192	.173	.162	.415
107	SKREW	1.041	-1.308	1.491	-.627	-1.653	-1.073	-1.728	.144	.348	-1.489	-1.641	-.122
107	INCRMT	.10	.10	.12	.39	.26	.81	.20	.15	.10	.10	.10	.10
107	YEARS	3	3	3	3	3	3	3	3	3	3	3	3
110	MEAN	.815	.715	.849	1.130	1.290	1.758	1.858	2.051	1.982	1.536	1.020	.770
110	STD DEV	.444	.130	.262	.439	.164	.259	.190	.208	.328	.530	.400	.240
110	SKREW	1.211	-.835	.220	.071	.626	1.454	.371	-.453	.485	1.041	1.085	-.121
110	INCRMT	.10	.10	.10	.20	.20	.67	.77	1.21	1.20	.65	.15	.10
110	YEARS	5	5	5	5	5	5	5	5	5	5	5	5
111	MEAN	1.439	1.298	1.335	1.673	1.784	2.281	2.407	2.734	2.760	2.462	1.953	1.524
111	STD DEV	.469	.223	.223	.473	.182	.213	.166	.115	.187	.449	.408	.302
111	SKREW	1.117	.620	1.004	-.243	.258	.208	.278	-1.429	.892	.472	-.019	-.939
111	INCRMT	.43	.22	.24	.69	.64	2.07	2.67	5.50	6.13	4.23	1.21	.39
111	YEARS	4	4	4	4	4	4	4	4	4	4	4	4

FREQUENCY STATISTICS AFTER ADJUSTMENTS

STA	ITEM	10	11	12	1	2	3	4	5	6	7	8	9
107	MEAN	.012	.203	.769	1.402	1.410	1.826	1.321	1.177	.710	.316	-.033	-.312
	STD DEV	.409	.389	.057	.003	.157	.227	.187	.087	.228	.166	.133	.415
	SKW	1.041	-1.508	1.491	-.627	-1.653	-1.073	-1.728	.144	.348	-1.489	-1.641	-.122
	INCRMT	.10	.10	.12	.39	.26	.81	.26	.15	.10	.10	.10	.10
110	MEAN	.315	.715	.849	1.130	1.290	1.758	1.858	2.051	1.982	1.536	1.020	.770
	STD DEV	.444	.130	.262	.439	.164	.259	.190	.208	.328	.530	.400	.240
	SKW	1.211	-.835	.220	.671	.626	1.454	.371	-.453	.485	1.041	1.085	-.121
	INCRMT	.10	.10	.10	.20	.20	.67	.77	1.21	1.20	.65	.15	.10
111	MEAN	1.448	1.334	1.385	1.609	1.782	2.250	2.372	2.681	2.693	2.368	1.890	1.507

STD DEV	.407	.209	.224	.409	.158	.163	.198	.163	.153	.220	.441	.380	.265
SKW	1.017	.620	1.004	-.243	.258	.278	.288	.278	-1.429	.892	.472	-.019	-.939
INCRMT	.43	.22	.24	.69	.64	2.67	2.07	2.67	5.50	6.13	4.23	1.21	.39

RAW CORRELATION COEFFICIENTS FOR MONTH 10

STA	107	110	111
			WITH CURRENT MONTH
107	1.000	.998	.987
110	.998	1.000	.997
111	.987	.997	1.000
			WITH PRECEDING MONTH AT ABOVE STATION
107	-4.000	.534	.526
110	.905	.588	.578
111	-4.000	.663	.656

RAW CORRELATION COEFFICIENTS FOR MONTH 11

STA	107	110	111
			WITH CURRENT MONTH
107	1.000	.970	1.000
110	.970	1.000	.974
111	1.000	.974	1.000
			WITH PRECEDING MONTH AT ABOVE STATION
107	.964	.981	.994
110	.870	.881	.944
111	.964	.982	.994

NOTE: Remaining months not shown.

# RECORDED AND RECONSTITUTED FLOWS

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
107	1904	CE	2E	1E	15E	24E	48E	20E	11E	4E	2E	1E	CE	128
107	1905	5	2	4	10	30	36	14	15	4	1	1	0	122
107	1906	0	1	2	33	17	84	33	18	11	3	1	0	203
107	1907	1	2	31	73	32	121	32	12	6	3	1	1	315
107	1908	1E	2E	10E	46E	32E	50E	15E	13E	2E	1E	1E	0E	185
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
110	1904	3	4	3	1	13	47	4	5	6	7	8	9	375
110	1905	33	0	5	7	14	34	47	141	70	14	7	7	375
110	1906	3	3	5	49	23	152	110	88	83	18	5	3	343
110	1907	6	6	14	26	33	64	118	200	288	216	43	12	1104
110	1908	7	6	12	13	19	37	48	122	124	65	16	6	600
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
111	1904	12	14	13	1	37	134	4	5	6	7	8	9	1686
111	1905	119	38	23	12	51	116	212	590	431	123	65	43	1686
111	1906	11	12	16	146	68	330	165	366	386	116	28	13	1449
111	1907	31	23	43	88	101	248	287	682	1010	1000	270	67	3899
111	1908	30E	24E	40E	51E	64E	107E	149E	294E	269E	70E	48E	29E	2732
														1175

## ADJUSTED FREQUENCY STATISTICS

STA	ITEM	10	11	12	1	2	3	4	5	6	7	8	9
107	MEAN	.019	.278	.761	1.451	1.424	1.807	1.336	1.141	.712	.313	.009	-.314
	STD DEV	.412	.086	.575	.350	.122	.202	.176	.082	.233	.172	.116	-.294
	SKEW	1.185	-.585	.399	-.251	-1.298	.445	.192	1.018	.135	.335	-1.606	-.061
	INCRMT	.10	.10	.12	.39	.26	.81	.26	.15	.10	.10	.10	.10
110	MEAN	.815	.715	.849	1.130	1.290	1.758	1.858	2.051	1.982	1.536	1.020	.770
	STD DEV	.444	.130	.262	.439	.164	.259	.190	.208	.328	.530	.400	.240
	SKEW	1.211	-.835	.220	.071	.626	1.454	.371	-.453	.485	1.041	1.085	-.121
	INCRMT	.10	.10	.10	.20	.20	.67	.77	1.21	1.20	.65	.15	.10
111	MEAN	1.447	1.314	1.388	1.682	1.789	2.232	2.361	2.683	2.696	2.344	1.902	1.512
	STD DEV	.407	.197	.227	.410	.158	.215	.176	.152	.216	.470	.372	.263
	SKEW	.964	.188	.070	-.335	.094	.677	.580	-.629	.541	.722	.545	-.671
	INCRMT	.43	.22	.24	.69	.64	2.07	2.67	5.50	6.15	4.23	1.21	.39

CONSISTENT CORRELATION MATRIX FOR MONTH 10

STA	107	110	111
	WITH CURRENT MONTH		
107	1.000	.997	.989
110	.997	1.000	.997
111	.989	.997	1.000
	WITH PRECEDING MONTH AT ABOVE STATION		
107	.463	.526	.516
110	.458	.588	.576
111	.481	.660	.651

CONSISTENT CORRELATION MATRIX FOR MONTH 11

STA	107	110	111
	WITH CURRENT MONTH		
107	1.000	.960	.999
110	.960	1.000	.954
111	.999	.954	1.000
	WITH PRECEDING MONTH AT ABOVE STATION		
107	.964	.975	.985
110	.867	.881	.904
111	.969	.980	.990

NOTE: Remaining months not shown.

MAXIMUM VOLUMES FOR PERIOD 1 OF 5 YEARS OF RECORDED AND RECONSTITUTED FLOWS

STA	10	11	12	1	2	3	4	5	6	7	8
107	5	2	31	73	32	121	33	18	11	3	1
110	33	6	14	49	33	152	118	200	288	216	43
111	119	38	43	146	101	330	403	682	1010	1000	270
996	157	40	88	228	167	566	553	900	1309	1219	314

MINIMUM VOLUMES

STA	10	11	12	1	2	3	4	5	6	7	8
107	0	1	1	10	17	36	14	11	2	1	1
110	3	3	3	4	13	34	47	55	36	11	5
111	11	12	13	12	37	107	149	294	269	70	28
996	14	17	18	31	74	187	212	362	308	83	33

INCONSISTENT CORREL MATRIX FOR I= 1 K= 2 DTRMC= 1.001

INCONSISTENT CORREL MATRIX ADJUSTED 0 1 3 1.000

1-MO	6-MO	54-MO	AV
9	9	54-MO	AV
1	6	869	
12	36	2564	
67	196	10220	
80	239	13726	



GENERATED FLOWS FOR PERIOD 1

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
107	1	1	2	4	12	37	28	8	5	6	7	8	9	107
107	2	1	2	3	9	12	43	17	11	2	1	1	0	107
107	3	1	2	3	9	24	64	31	15	9	3	1	0	111
107	4	1	2	11	36	28	61	22	15	9	3	1	0	207
107	5	1	2	1	6	27	50	16	11	3	1	1	0	189
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
110	1	7	5	6	1	11	25	28	5	6	7	8	9	195
110	2	3	4	5	22	15	40	56	55	36	10	4	5	585
110	3	3	5	9	30	22	96	103	184	200	41	9	6	817
110	4	8	6	9	13	19	50	69	154	226	125	29	15	698
110	5	6	5	3	4	14	49	58	162	228	112	16	6	288
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
111	1	26	11	12	1	2	60	124	5	6	7	8	9	920
111	2	13	14	22	11	40	132	190	254	237	62	32	30	2469
111	3	13	16	28	80	46	287	290	698	836	337	71	34	3003
111	4	39	28	34	100	75	163	214	575	781	552	245	81	2703
111	5	25	19	13	13	44	109	213	420	308	77	22	6	1269

MAXIMUM VOLUMES FOR PERIOD 1 OF 5 YEARS OF SYNTHETIC FLOWS

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV	MO
107	1	1	2	4	12	37	64	31	15	9	3	1	0	64	192	724	12	12
110	8	6	9	22	96	103	184	228	125	29	15	29	15	228	731	2555	43	43
111	39	28	34	100	75	287	698	836	572	245	81	245	81	836	2691	10255	173	173
996	47	36	54	178	121	447	895	1046	687	275	96	275	96	1046	3545	13522	228	228
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV	MO
107	1	11	12	1	2	3	4	5	6	7	8	9	9	1-MO	6-MO	54-MO	AV	MO
110	3	4	3	6	12	28	8	11	2	1	1	1	0	0	6	648	6	6
111	13	14	13	11	11	25	28	36	9	9	4	4	2	2	31	2427	2427	2427
996	16	20	17	11	40	60	124	237	62	22	22	22	6	6	149	9506	9506	9506
				23	74	113	160	275	73	26	8	8	8	8	207	12648	12648	12648

GENERATED FLOWS FOR PERIOD 2

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
107	6	0	1	1	15	16	77	34	18	7	3	1	9	174
107	7	0	2	145	160	35	79	20	15	5	2	1	0	473
107	8	0	1	8	48	26	65	20	11	4	1	1	0	185
107	9	1	2	3	20	25	51	24	13	3	2	1	0	145
107	10	1	2	20	61	23	115	33	13	8	3	1	0	280
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
110	6	2	3	3	20	22	106	113	124	151	72	27	9	655
110	7	64	8	33	28	25	42	66	106	90	32	10	12	510
110	8	2	4	9	21	18	47	71	114	63	12	6	4	374
110	9	4	5	5	9	18	84	79	94	55	38	7	6	404
110	10	5	7	13	19	27	87	122	169	197	146	26	11	829
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
111	6	9	11	9	64	63	292	325	542	641	438	218	9	2680
111	7	207	48	92	102	85	146	189	476	470	198	87	68	2134
111	8	9	11	25	72	68	149	243	508	396	104	50	26	1661
111	9	17	17	20	34	57	211	249	385	337	174	53	33	1587
111	10	23	23	39	71	69	284	373	672	784	675	199	62	3274

MAXIMUM VOLUMES FOR PERIOD 2 OF 5 YEARS OF SYNTHETIC FLOWS

STA	IC	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV	MO
107	9	2	145	160	35	115	34	18	8	3	1	1	160	454	1254	21	21
110	64	8	33	28	27	106	122	159	197	146	27	12	197	748	2707	46	46
111	207	48	92	102	85	292	373	672	784	675	218	68	784	2987	11121	189	189
996	280	59	270	289	145	528	855	990	990	824	246	81	990	3908	15054	256	256
MINIMUM	VOLUMES																
STA	IC	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV	MO
107	0	1	1	15	16	51	20	11	3	1	1	0	0	8	1150	21	21
110	2	3	3	9	18	42	66	94	55	12	6	4	2	33	2216	46	46
111	9	11	9	34	57	146	189	385	337	104	50	26	9	163	8936	189	189
996	11	15	12	63	100	261	275	492	395	118	56	30	11	223	12386	256	256

TEST DATA - 723-X6-L2340  
MONTHLY STREAMFLOW SIMULATION - NOV 1970  
MULTI-PASS RECONSTITUTION AND GENERATION

YR	IMNTH	IANAL	MXRCS	NYRG	NYMXG	NPASS	IPCHQ	IPCHS	NSTA	NCOMB	NTNDM	NCSTY	IGNRL	NPROJ	IYRPJ	MTHPJ	LYRPJ
1904	10	1	5	10	5	2	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0
MAXIMUM VOLUMES OF RECORDED FLOWS																	
STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV	MO
107	5	2	31	73	33	121	33	18	11	3	1	1	121	302-9999998	18		
110	34	6	14	49	33	152	118	200	288	216	43	12	288	1009	2656	45	
MINIMUM VOLUMES																	
STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV	MO
107	0	1	2	10	17	37	14	12	4	1	1	C	0	6	99999999		
110	3	3	3	4	13	34	48	56	36	11	5	3	3	36	2519		

FREQUENCY STATISTICS

STA	ITEM	10	11	12	1	2	3	4	5	6	7	8	9
107	MEAN	.112	.283	.820	1.465	1.410	1.862	1.395	1.177	.834	.395	.000	-.312
	STD DEV	.513	.108	.597	.433	.157	.263	.214	.087	.192	.173	.162	.415
	SKW	1.041	-1.308	1.491	-.627	-1.653	-1.073	-1.728	.144	.348	-1.489	-1.641	-.122
	INCRMT	.10	.10	.12	.39	.26	.81	.26	.15	.10	.10	.10	.10
	YEARS	3	3	3	3	3	3	3	3	3	3	3	3
110	MEAN	.815	.715	.849	1.130	1.290	1.758	1.858	2.051	1.982	1.536	1.020	.770
	STD DEV	.444	.130	.262	.439	.164	.259	.190	.208	.328	.530	.400	.240
	SKW	1.211	-.835	.220	.071	.626	1.454	.371	-.453	.485	1.041	1.085	-.121
	INCRMT	.10	.10	.10	.20	.20	.67	.77	1.21	1.20	.65	.15	.10
	YEARS	5	5	5	5	5	5	5	5	5	5	5	5

FREQUENCY STATISTICS AFTER ADJUSTMENTS

STA	ITEM	10	11	12	1	2	3	4	5	6	7	8	9
107	MEAN	.012	.283	.769	1.403	1.410	1.862	1.321	1.177	.710	.316	-.033	-.312
	STD DEV	.409	.089	.637	.363	.157	.263	.187	.087	.228	.166	.133	.415
	SKW	1.041	-1.308	1.491	-.627	-1.653	-1.073	-1.728	.144	.348	-1.489	-1.641	-.122
	INCRMT	.10	.10	.12	.39	.26	.81	.26	.15	.10	.10	.10	.10
	YEARS	3	3	3	3	3	3	3	3	3	3	3	3
110	MEAN	.815	.715	.849	1.130	1.290	1.758	1.858	2.051	1.982	1.536	1.020	.770
	STD DEV	.444	.130	.262	.439	.164	.259	.190	.208	.328	.530	.400	.240
	SKW	1.211	-.835	.220	.071	.626	1.454	.371	-.453	.485	1.041	1.085	-.121
	INCRMT	.10	.10	.10	.20	.20	.67	.77	1.21	1.20	.65	.15	.10
	YEARS	5	5	5	5	5	5	5	5	5	5	5	5

# RAW CORRELATION COEFFICIENTS FOR MONTH 10

STA	107	110	WITH CURRENT MONTH
107	1.000	.998	
110	.998	1.000	
107	-.4.000	.234	WITH PRECEDING MONTH AT ABOVE STATION
110	.905	.588	

# RAW CORRELATION COEFFICIENTS FOR MONTH 11

STA	107	110	WITH CURRENT MONTH
107	1.000	.970	
110	.970	1.000	
107	.964	.980	WITH PRECEDING MONTH AT ABOVE STATION
110	.870	.881	

NOTE: Remaining months not shown.

# RECORDED AND RECONSTITUTED FLOWS PASS 1

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
107	1904	0E	2E	1E	12E	27E	68E	20E	11E	4E	2E	1E	0E	148
110	1904	5	2	4	10	30	36	14	15	4	1	1	0	122
107	1905	0	1	2	33	17	84	33	18	11	3	1	0	203
107	1906	1	2	31	73	32	121	32	12	6	3	1	1	315
107	1907	1E	4E	20E	44E	24E	84E	16E	17E	3E	1E	1E	0E	213
107	1908	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
110	1904	3	4	3	4	13	47	62	141	70	14	7	7	375
110	1905	33	6	5	7	14	34	47	68	83	18	5	3	343
110	1906	3	3	5	49	23	152	110	200	288	216	43	12	1104
110	1907	0	6	14	26	33	64	118	122	124	65	16	6	600
110	1908	7	6	12	13	19	37	48	55	36	11	5	5	254

# ADJUSTED FREQUENCY STATISTICS

STA	ITEM	10	11	12	1	2	3	4	5	6	7	8	9
107	MEAN	.019	.285	.788	1.427	1.408	1.870	1.342	1.167	.707	.318	-.037	-.453
107	STD DEV	.412	.085	.586	.365	.113	.189	.172	.091	.230	.166	.144	.424
107	SKEW	1.185	-.822	.383	-.144	-1.182	-.994	.140	-.143	.453	.436	-.327	-.071
107	INCRMT	.10	.10	.12	.39	.26	.31	.26	.15	.10	.10	.10	.10
110	MEAN	.315	.715	.849	1.130	1.290	1.758	1.858	2.051	1.982	1.536	1.020	.770
110	STD DEV	.444	.130	.262	.439	.164	.259	.190	.208	.328	.530	.400	.240
110	SKEW	1.211	-.835	.220	.071	.625	1.454	.371	-.453	.485	1.541	1.085	-.121
110	INCRMT	.10	.10	.10	.20	.20	.07	.77	1.21	1.20	.65	.15	.10

CONSISTENT CORRELATION MATRIX FOR MONTH 10

STA	107	110
	WITH CURRENT MONTH	
107	1.000	.997
110	.997	1.000
	WITH PRECEDING MONTH AT ABOVE STATION	
107	.481	.526
110	.475	.588

CONSISTENT CORRELATION MATRIX FOR MONTH 11

STA	107	110
	WITH CURRENT MONTH	
107	1.000	.972
110	.972	1.000
	WITH PRECEDING MONTH AT ABOVE STATION	
107	.941	.950
110	.867	.881

NOTE: Remaining months not shown.

MAXIMUM VOLUMES FOR PERIOD 1 OF 5 YEARS OF RECORDED AND RECONSTITUTED FLOWS

STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV MO
107	5	2	31	73	32	121	33	18	11	3	1	1	121	302	1000	17
110	33	6	14	49	33	152	118	200	288	216	43	12	288	1009	2656	45

MINIMUM VOLUMES

STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV MO
107	0	1	1	10	17	36	14	11	3	1	1	0	0	6	894	6
110	3	3	3	4	13	34	47	55	36	11	5	3	3	36	2564	36

INCONSISTENT CORREL MATRIX FOR I= 1 K= 2 DIRM= 1.000

PASS 2  
STA(S) FROM PREVIOUS PASSES 110  
MAXIMUM VOLUMES OF RECORDED FLOWS  
STA 10 11 12 1 146 101 330 403 682 1010 1300 270 67 1010 1-MO 54-MO AV MO  
111 119 58 43 12 13 13 116 105 360 2.07 2.67 5.50 4.23 1.21 .39 3579-99999998 204

MINIMUM VOLUMES  
STA 10 11 12 1 13 37 116 105 360 2.07 2.67 5.50 4.23 1.21 .39 196 99999999 54-MO AV MO  
111 11 12 13 13 37 116 105 360 2.07 2.67 5.50 4.23 1.21 .39 196 99999999 54-MO AV MO

#### FREQUENCY STATISTICS

STA	ITEM	10	11	12	1	2	3	4	5	6	7	8	9
111	MEAN	1.439	1.298	1.335	1.673	1.784	2.281	2.407	2.734	2.760	2.462	1.953	1.524
	STD DEV	.469	.223	.223	.473	.182	.213	.160	.115	.187	.449	.408	.302
	SKEW	1.117	.620	1.004	-.243	.258	.208	.278	-1.429	.892	.472	-.019	-.939
	INCRMT	.43	.22	.24	.69	.64	2.07	2.67	5.50	6.13	4.23	1.21	.39
	YEARS	4	4	4	4	4	4	4	4	4	4	4	4

#### FREQUENCY STATISTICS AFTER ADJUSTMENTS

STA	ITEM	10	11	12	1	2	3	4	5	6	7	8	9
110	MEAN	.815	.715	.849	1.130	1.290	1.758	1.858	2.051	1.982	1.536	1.020	.770
	STD DEV	.444	.130	.262	.439	.164	.259	.190	.208	.328	.530	.400	.240
	SKEW	1.211	-.835	.220	.071	.626	1.454	.371	-.453	.485	1.041	1.085	-.121
	INCRMT	.10	.10	.10	.20	.20	.67	.77	1.21	1.20	.65	.15	.10
111	MEAN	1.448	1.334	1.385	1.669	1.782	2.250	2.372	2.681	2.693	2.368	1.890	1.507
	STD DEV	.407	.209	.224	.409	.158	.198	.163	.153	.220	.441	.380	.265
	SKEW	1.117	.620	1.004	-.243	.258	.208	.278	-1.429	.892	.472	-.019	-.939
	INCRMT	.43	.22	.24	.69	.64	2.07	2.67	5.50	6.13	4.23	1.21	.39

# RAW CORRELATION COEFFICIENTS FOR MONTH 10

STA	110	111	
			WITH CURRENT MONTH
110	1.000	.997	
111	.997	1.000	
			WITH PRECEDING MONTH AT ABOVE STATION
110	.588	.578	
111	.663	.656	

# RAW CORRELATION COEFFICIENTS FOR MONTH 11

STA	110	111	
			WITH CURRENT MONTH
110	1.000	.974	
111	.974	1.000	
			WITH PRECEDING MONTH AT ABOVE STATION
110	.881	.944	
111	.982	.994	

NOTE: Remaining months not shown.

# RECORDED AND RECONSTITUTED FLOWS PASS 2

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
111	1904	12	14	13	12	37	134	212	590	431	123	65	43	1686
111	1905	119	38	23	28	51	116	165	366	386	116	28	13	1449
111	1906	11	12	16	146	68	330	287	682	1010	1000	270	67	3899
111	1907	31	23	43	88	101	248	403	563	625	454	121	32	2732
111	1908	34E	23E	35E	47E	52E	137E	180E	256E	313E	95E	33E	29E	1234

# ADJUSTED FREQUENCY STATISTICS

STA	ITEM	10	11	12	1	2	3	4	5	6	7	8	9
111	MEAN	1.458	1.312	1.378	1.674	1.771	2.254	2.378	2.671	2.709	2.369	1.870	1.512
	STD DEV	.409	.196	.216	.409	.163	.195	.158	.173	.198	.441	.399	.263
	SKEW	.820	.239	.089	-.243	.615	.737	.811	-.878	.898	.896	.578	-.674
	INCRMT	.43	.22	.24	.69	.64	2.07	2.67	5.50	6.13	4.23	1.21	.39

STA	110	111	
110	1.000	.996	WITH CURRENT MONTH
111	.996	1.000	
			WITH PRECEDING MONTH AT ABOVE STATION
110	.588	.578	
111	.653	.642	

STA	110	111	
			WITH CUKRENT MONTH
110	1.000	.949	
111	.949	1.000	
			WITH PRECEDING MONTH AT ABOVE STATION
110	.881	.920	
	.981	.994	

NOTE: Remaining months not shown.

[illegible]

MINIMUM VOLUMES																
	11	12	13	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV MD
A	10	11	12	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
B	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
C	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
D	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
E	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
F	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
G	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
H	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
I	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
J	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
K	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
L	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
M	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
N	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
O	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
P	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
Q	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
R	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
S	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
T	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
U	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
V	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
W	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
X	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
Y	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183
Z	11	12	13	12	1	146	101	330	403	682	1010	1000	270	3579	10890	183

GENERATED FLOWS FOR PERIOD 1  
PASS 1

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
107	1	2	2	11	67	25	67	25	19	6	3	1	1	229
107	2	2	2	11	54	29	133	36	15	9	3	1	2	304
107	3	0	1	0	7	24	119	42	17	11	3	1	0	225
107	4	1	2	93	101	25	103	16	14	4	2	1	0	362
107	5	1	2	3	28	25	100	28	15	5	2	1	0	210
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
110	1	10	11	10	1	2	3	4	5	6	7	8	9	586
110	2	14	6	10	30	20	55	75	135	106	82	47	6	814
110	3	12	6	12	32	32	110	123	183	201	89	12	2	982
110	4	2	3	2	12	19	143	140	237	267	111	33	13	335
110	5	10	7	23	29	24	31	51	64	65	20	7	4	531
110	5	8	5	5	41	24	79	91	150	91	23	9	5	531





GENERATED FLOWS FOR PERIOD 2  
PASS 1

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
107	6	1	2	7	29	14	83	18	12	3	2	1	9	172
107	7	1	2	5	23	24	89	36	18	3	6	2	1	225
107	8	2	2	2	5	22	22	14	16	4	2	1	1	92
107	9	0	1	2	24	22	64	18	15	2	1	1	1	150
107	10	0	1	3	31	19	57	15	15	3	1	1	0	146
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
110	6	6	6	7	21	16	37	61	84	54	14	8	8	322
110	7	6	6	6	18	18	96	115	164	534	783	335	21	2102
110	8	19	6	4	2	9	40	45	95	74	28	9	6	337
110	9	2	4	4	15	16	42	55	65	34	9	3	3	252
110	10	3	4	6	30	17	34	48	91	54	11	4	4	306

MAXIMUM VOLUMES FOR PERIOD 2 OF 5 YEARS OF SYNTHETIC FLOWS

STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV MO
107	2	2	7	31	24	89	36	18	18	6	2	1	89	208	778	13
110	19	6	7	30	18	96	115	164	534	783	335	21	783	2027	3281	55
STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV MO
107	0	1	2	5	14	22	14	12	2	1	1	0	0	6	650	13
110	2	4	4	2	9	34	45	65	34	9	3	3	2	27	3149	55

GENERATED FLOWS FOR PERIOD 2  
PASS 2

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL		
111	6	26	22	26	67	56	135	208	390	392	108	60	48	1538		
111	7	28	22	24	67	65	252	339	635	1339	2916	2337	100	8124		
111	8	96	34	18	31	115	115	157	394	400	182	72	33	1538		
111	9	8	11	14	52	42	136	176	316	281	72	22	14	1144		
111	10	11	13	18	99	62	131	164	395	379	117	26	22	1437		
MAXIMUM VOLUMES FOR PERIOD 2 OF 5 YEARS OF SYNTHETIC FLOWS																
STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV MO
111	96	34	26	99	65	252	339	635	1339	2916	2337	100	2916	7819	13594	230
MINIMUM VOLUMES																
STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV MO
111	8	11	14	6	31	115	157	201	72	22	14	6	6	152	12818	

TEST DATA - 723-X6-L2340  
MONTHLY STREAMFLOW SIMULATION - NOV 1970  
FLOW PROJECTIONS

STATION	10	1	5	-C	-0	1	-0	IPCHQ	IPCHS	NSTA	NCOMB	NTNDM	NCSTV	IGNRL	NPROJ	IVRPJ	MTHPJ	LYRPJ
IYRA	104	10	1	5	-C	-0	1	-0	1	-0	-0	-0	-0	-0	2	1909	10	1913
MAXIMUM VOLUMES OF RECORDED FLOWS																		
STA	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
110	34	6	14	49	33	152	118	200	288	216	43	12	288	1009	3579	99999998	54-MO	AV MO
111	119	38	43	140	101	330	403	682	1010	1000	270	67	1010	3579	99999998	207	45	207
MINIMUM VOLUMES																		
STA	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
110	3	3	3	4	13	34	48	56	36	11	5	3	3	36	2519	54-MO	AV MO	AV MO
111	11	12	13	13	37	116	165	306	386	116	28	13	11	196	99999999	54-MO	AV MO	AV MO

FREQUENCY STATISTICS

STA	ITEM	10	11	12	1	2	3	4	5	6	7	8	9
110	MEAN	.815	.715	.849	1.130	1.290	1.758	1.858	2.051	1.982	1.536	1.020	.770
	STD DEV	.444	.130	.262	.439	.164	.259	.190	.208	.328	.530	.400	.240
	SKW	1.211	-.835	.220	.071	.026	1.454	.371	-.453	.485	1.041	1.085	-.121
	INCRMT	.10	.10	.10	.20	.20	.67	.77	1.21	1.20	.65	.15	.10
	YEARS	5	5	5	5	5	5	5	5	5	5	5	5
111	MEAN	1.439	1.498	1.335	1.673	1.784	2.281	2.407	2.734	2.760	2.462	1.953	1.526
	STD DEV	.469	.223	.223	.473	.182	.213	.166	.115	.187	.449	.408	.370
	SKW	1.117	.620	1.004	-.243	.258	.208	.278	-1.429	.892	.472	-.019	-1.204
	INCRMT	.43	.22	.24	.69	.64	2.07	2.67	5.50	6.13	4.23	1.21	.41
	YEARS	4	4	4	4	4	4	4	4	4	4	4	3

FREQUENCY STATISTICS AFTER ADJUSTMENTS

STA	ITEM	10	11	12	1	2	3	4	5	6	7	8	9
110	MEAN	.815	.715	.849	1.130	1.290	1.758	1.858	2.051	1.982	1.536	1.020	.770
	STD DEV	.444	.130	.262	.439	.164	.259	.190	.208	.328	.530	.400	.240
	SKW	1.211	-.835	.220	.071	.026	1.454	.371	-.453	.485	1.041	1.085	-.121
	INCRMT	.10	.10	.10	.20	.20	.67	.77	1.21	1.20	.65	.15	.10
	YEARS	5	5	5	5	5	5	5	5	5	5	5	5
111	MEAN	1.448	1.334	1.385	1.669	1.782	2.250	2.372	2.681	2.693	2.368	1.890	1.499
	STD DEV	.407	.209	.224	.409	.158	.198	.163	.153	.220	.441	.380	.266
	SKW	1.117	.620	1.004	-.243	.258	.208	.278	-1.429	.892	.472	-.019	-1.204
	INCRMT	.43	.22	.24	.69	.64	2.07	2.67	5.50	6.13	4.23	1.21	.41
	YEARS	4	4	4	4	4	4	4	4	4	4	4	3

# RAW CORRELATION COEFFICIENTS FOR MONTH 10

STA	110	111
110	1.000	.997
111	.997	1.000
WITH PRECEDING MONTH AT ABOVE STATION		
110	.588	.538
111	.663	.613

# RAW CORRELATION COEFFICIENTS FOR MONTH 11

STA	110	111
110	1.000	.974
111	.974	1.000
WITH PRECEDING MONTH AT ABOVE STATION		
110	.881	.944
111	.982	.994

NOTE: Remaining months not shown.

# RECORDED AND RECONSTITUTED FLOWS

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
110	1904	3	4	3	4	13	47	62	141	70	14	7	7	375
110	1905	33	6	5	7	14	34	47	88	83	18	5	3	343
110	1906	3	3	5	49	23	152	110	200	288	216	43	12	1104
110	1907	0	6	14	26	33	64	118	122	124	65	16	6	600
110	1908	7	6	12	13	19	37	48	55	36	11	5	5	254
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
111	1904	12	14	13	12	37	134	212	590	431	123	65	9	1686
111	1905	119	38	23	28	51	116	165	366	386	116	28	43	1449
111	1906	11	12	16	146	68	330	287	682	1010	1000	270	67	3899
111	1907	31	23	43	88	101	248	403	563	625	454	121	33E	2733
111	1908	34E	26E	39E	47E	59E	116E	136E	279E	315E	98E	43E	30E	1222

# ADJUSTED FREQUENCY STATISTICS

STA	ITEM	10	11	12	1	2	3	4	5	6	7	8	9
110	MEAN	.815	.715	.849	1.130	1.290	1.758	1.858	2.051	1.982	1.536	1.020	.770
	STD DEV	.444	.130	.262	.439	.164	.259	.190	.208	.328	.530	.400	.240
	SKREW	1.211	-.835	.220	.071	.626	1.454	.371	-.453	.485	1.041	1.085	-.121
	INCRMT	.10	.10	.10	.20	.20	.67	.77	1.21	1.20	.65	.15	.10
111	MEAN	1.459	1.321	1.386	1.674	1.783	2.240	2.354	2.678	2.709	2.371	1.892	1.518
	STD DEV	.409	.200	.224	.409	.158	.207	.186	.160	.198	.439	.379	.262
	SKREW	.806	.043	.068	-.239	.297	.741	.399	-.725	.906	.908	.581	-.785
	INCRMT	.43	.22	.24	.69	.64	2.07	2.67	5.50	6.13	4.23	1.21	.41

STA	110	111	
110	1.050	.995	WITH CURRENT MONTH
111	.995	1.000	
110	.588	.531	WITH PRECEDING MONTH AT ABOVE STATION
111	.652	.596	

STA	110	111	
110	1.000	.967	WITH CURRENT MONTH
111	.967	1.000	
110	.881	.922	WITH PRECEDING MONTH AT ABOVE STATION
111	.972	.990	

NOTE: Remaining months not shown.

MAXIMUM VOLUMES FOR PERIOD		5 YEARS OF RECORDED AND RECONSTITUTED FLOWS										AV. MO.			
STA	IC	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV	MO.
110	33	6	14	49	152	200	288	216	43	12	288	1009	2656	45	
111	119	38	101	330	403	682	1010	1000	270	67	1010	3579	10872	183	
MINIMUM VOLUMES															
STA	IC	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV	MO.
110	3	4	13	34	47	55	36	11	5	3	3	36	2564		
111	11	12	37	116	136	279	315	98	28	13	11	196	10214		

GENERATED FLOWS FOR PERIOD 1

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
110	1909	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
110	1910	3	5	12	99	37	43	74	124	162	47	26	10	642
110	1911	11	7	19	27	19	131	106	172	241	304	85	12	1114
110	1912	8	6	4	11	36	136	103	267	744	766	123	13	2215
110	1913	11	7	14	79	37	42	66	110	159	35	8	4	572
110	1913	2	3	8	28	16	58	62	120	59	25	13	10	404
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
111	1909	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
111	1910	16	17	33	265	96	185	216	480	850	418	197	55	2628
111	1911	52	29	54	99	55	291	293	666	1037	1561	384	69	4590
111	1912	29	25	15	38	81	344	241	833	2588	3593	626	73	8484
111	1913	54	30	45	218	129	182	189	475	642	217	59	27	2267
111	1913	6	9	23	92	49	185	167	474	399	209	129	60	1802

GENERATED FLOWS FOR PERIOD 2

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
110	1909	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
110	1910	6	5	9	27	28	59	90	150	118	31	8	4	535
110	1911	6	5	7	34	34	84	116	217	201	65	21	10	800
110	1912	29	8	12	9	16	28	38	45	37	9	4	3	238
110	1913	2	3	4	29	19	53	73	127	161	72	26	11	580
110	1913	19	7	13	4	13	34	57	90	52	11	4	4	308
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
111	1909	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
111	1910	26	21	29	96	97	214	248	596	649	225	69	24	2294
111	1911	28	20	23	113	129	329	280	727	631	433	165	60	2938
111	1912	122	42	44	35	52	88	138	257	309	77	30	19	1213
111	1913	10	12	14	99	62	169	238	495	669	519	205	62	2554
111	1913	87	37	46	15	44	114	196	396	346	87	33	21	1422

TEST DATA - 723-X6-L2340  
MONTHLY STREAMFLOW SIMULATION - NOV 1970  
COMPUTE AND USE GENERALIZED STATISTICS

IYRA	INTH	IANAL	HXRCS	NYRG	NYMXG	NPASS	IPCHO	IPCHS	NSTA	NCONB	NTNDM	NCSTY	IGNRL	NPROJ	IYRPJ	MTHPJ	LYRPJ
1004	10	1	5	10	10	1	1	-0	-0	-0	-0	-0	2	-0	-0	-0	-0
MAXIMUM VOLUMES OF RECORDED FLOWS																	
STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV	MO
110	34	6	14	49	33	152	118	200	288	216	43	12	288	1009	2656	45	
111	119	38	43	146	101	330	403	682	1010	1000	270	67	1010	3579	99999998	204	
MINIMUM VOLUMES																	
STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV	MO
110	3	3	4	13	34	56	48	56	36	11	5	3	3	36	2519		
111	11	12	13	37	116	366	165	366	386	116	28	13	11	196	99999999		

FREQUENCY STATISTICS

STA	ITEM	10	11	12	1	2	3	4	5	6	7	8	9
110	MEAN	.815	.715	.849	1.130	1.290	1.758	1.858	2.051	1.982	1.536	1.020	.770
	STD DEV	.444	.130	.262	.439	.164	.259	.190	.208	.328	.530	.400	.240
	SKW	1.211	-.835	.220	.071	.626	1.454	.371	-.453	.485	1.041	1.085	-.121
	INCRMT	.10	.10	.10	.20	.21	.67	.77	1.21	1.20	.65	.15	.10
	YEARS	5	5	5	5	5	5	5	5	5	5	5	5
111	MEAN	1.439	1.298	1.335	1.673	1.784	2.261	2.407	2.734	2.760	2.462	1.953	1.524
	STD DEV	.469	.223	.223	.473	.182	.213	.166	.115	.107	.449	.408	.302
	SKW	1.117	.620	1.004	-.243	.258	.208	.278	-1.429	.892	.472	-.019	-.939
	INCRMT	.44	.22	.24	.69	.64	2.07	2.67	5.50	6.13	4.23	1.21	.39
	YEARS	4	4	4	4	4	4	4	4	4	4	4	4

FREQUENCY STATISTICS AFTER ADJUSTMENTS

STA	ITEM	10	11	12	1	2	3	4	5	6	7	8	9
110	MEAN	.815	.715	.849	1.130	1.290	1.758	1.858	2.051	1.982	1.536	1.020	.770
	STD DEV	.444	.130	.262	.439	.164	.259	.190	.208	.328	.530	.400	.240
	SKW	1.211	-.835	.220	.071	.626	1.454	.371	-.453	.485	1.041	1.085	-.121
	INCRMT	.10	.10	.10	.20	.21	.67	.77	1.21	1.20	.65	.15	.10
	YEARS	5	5	5	5	5	5	5	5	5	5	5	5
111	MEAN	1.448	1.334	1.385	1.669	1.782	2.250	2.372	2.681	2.693	2.368	1.890	1.507
	STD DEV	.407	.209	.224	.409	.158	.198	.163	.153	.220	.441	.380	.265
	SKW	1.117	.620	1.004	-.243	.258	.208	.278	-1.429	.892	.472	-.019	-.939
	INCRMT	.44	.22	.24	.69	.64	2.07	2.67	5.50	6.13	4.23	1.21	.39
	YEARS	4	4	4	4	4	4	4	4	4	4	4	4

# RAW CORRELATION COEFFICIENTS FOR MONTH 10

STA	110	111	
			WITH CURRENT MONTH
110	1.000	.997	
111	.997	1.000	
			WITH PRECEDING MONTH AT ABOVE STATION
110	.508	.578	
111	.663	.656	

# RAW CORRELATION COEFFICIENTS FOR MONTH 11

STA	110	111	
			WITH CURRENT MONTH
110	1.000	.974	
111	.974	1.000	
			WITH PRECEDING MONTH AT ABOVE STATION
110	.881	.949	
111	.982	.994	

NOTE: Remaining months not shown

# RECORDED AND RECONSTITUTED FLOWS

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
110	1904	3	4	3	4	13	47	62	141	70	14	7	9	375
110	1905	33	6	5	7	14	34	47	88	83	18	5	7	343
110	1906	3	3	5	49	23	152	110	200	288	216	43	12	1104
110	1907	6	6	14	26	33	64	118	122	124	65	16	6	600
110	1908	7	6	12	13	19	37	48	55	36	11	5	5	254
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
111	1904	12	11	13	12	37	134	212	590	431	123	65	43	1686
111	1905	119	38	23	28	51	116	165	366	386	116	28	13	1449
111	1906	11	12	16	146	68	330	287	682	1010	1000	270	67	3899
111	1907	31	23	43	88	101	246	403	563	625	454	121	32	2732
111	1908	30E	25E	39E	48E	59E	131E	153E	216E	253E	117E	48E	29E	1148

# ADJUSTED FREQUENCY STATISTICS

STA	ITEM	10	11	12	1	2	3	4	5	6	7	8	9
110	MEAN	.815	.715	.849	1.130	1.290	1.758	1.858	2.051	1.982	1.536	1.020	.770
	STD DEV	.444	.130	.262	.439	.164	.259	.190	.208	.328	.530	.400	.240
	SKEW	1.211	-.835	.220	.071	.626	1.454	.371	-.453	.485	1.041	1.085	-.121
	INCRMT	.10	.10	.10	.20	.21	.67	.77	1.21	1.20	.65	.15	.10
111	MEAN	1.447	1.319	1.386	1.675	1.783	2.250	2.363	2.657	2.691	2.386	1.900	1.513
	STD DEV	.407	.199	.225	.409	.158	.198	.173	.200	.224	.424	.372	.263
	SKEW	.972	.077	.068	-.261	.281	.758	.626	-1.140	.389	.957	.550	-.696
	INCRMT	.44	.22	.24	.69	.64	2.07	2.67	5.50	6.13	4.23	1.21	.39



CONSISTENT CORRELATION MATRIX FOR MONTH 10

STA	110	111
	WITH CURRENT MONTH	
110	1.000	.997
111	.997	1.000
	WITH PRECEDING MONTH AT ABOVE STATION	
110	.588	.578
111	.660	.651

CONSISTENT CORRELATION MATRIX FOR MONTH 11

STA	110	111
	WITH CURRENT MONTH	
110	1.000	.964
111	.964	1.000
	WITH PRECEDING MONTH AT ABOVE STATION	
110	.881	.903
111	.974	.984

NOTE: Remaining months not shown

MAXIMUM VOLUMES FOR PERIOD		1 OF 5 YEARS OF RECORDED AND RECONSTITUTED FLOWS										AV MO	
STA		1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO
110	10	12	1	152	118	200	288	216	43	12	288	1009	2656
111	11	14	49	330	403	682	1010	1000	270	67	1010	3579	10797
		43	146	101									
MINIMUM VOLUMES		1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO
110	10	12	1	3	4	5	6	7	8	9	1-MO	6-MO	54-MO
111	11	13	4	34	47	55	36	11	5	3	3	36	2564
		13	12	116	153	216	253	116	28	13	11	196	10240

GENERALIZED STATISTICS

ST1	ST2	RAV	STA	AVMX	AVMN	SDAV	MAXMO	MINMO
110	110	.774	110	1.964	.767	.300	6	11
111	110	.981	111	2.578	1.384	.271	7	12
111	111	.789						

STA	110	111	
			WITH CURRENT MONTH
110	1.000	.981	
111	.981	1.000	
			WITH PRECEDING MONTH AT ABOVE STATION
110	.924	.853	
111	.853	.939	

STA	110	111	
			WITH CURRENT MONTH
110	1.000	.981	
111	.981	1.000	
			WITH PRECEDING MONTH AT ABOVE STATION
110	.924	.853	
111	.853	.939	

MAXIMUM VOLUMES FOR PERIOD		1 OF 5 YEARS OF RECORDED AND RECONSTITUTED FLOWS					AV MD							
STA		1	2	3	4	5	6	7	8	9	1-MD	6-MD	54-MD	AV MD
110	33	12	33	152	118	200	288	216	43	12	288	1009	2656	45
111	119	43	101	330	403	682	1010	1000	270	67	1010	3579	10797	182
MINIMUM VOLUMES														
STA		1	2	3	4	5	6	7	8	9 <td>1-MD</td> <td>6-MD</td> <td>54-MD</td> <td>AV MD</td>	1-MD	6-MD	54-MD	AV MD
110	3	12	13	34	47	55	36	11	5	3	1-MD	6-MD	54-MD	AV MD
111	11	13	37	116	153	216	253	116	28	13	11	196	2564	10240

GENERATED FLOWS FOR PERIOD 1

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
110	1	10	11	12	1	2	3	4	5	6	7	8	9	465
110	2	11	12	13	2	3	4	5	6	7	8	9	11	525
110	3	12	13	14	3	4	5	6	7	8	9	10	12	855
110	4	13	14	15	4	5	6	7	8	9	10	11	13	346
110	5	14	15	16	5	6	7	8	9	10	11	12	14	484
110	6	15	16	17	6	7	8	9	10	11	12	13	15	519
110	7	16	17	18	7	8	9	10	11	12	13	14	16	539
110	8	17	18	19	8	9	10	11	12	13	14	15	17	677
110	9	18	19	20	9	10	11	12	13	14	15	16	18	495
110	10	19	20	21	10	11	12	13	14	15	16	17	19	473
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
111	1	10	11	12	1	2	3	4	5	6	7	8	9	1865
111	2	11	12	13	2	3	4	5	6	7	8	9	10	1993
111	3	12	13	14	3	4	5	6	7	8	9	10	11	2790
111	4	13	14	15	4	5	6	7	8	9	10	11	12	1366
111	5	14	15	16	5	6	7	8	9	10	11	12	13	2189
111	6	15	16	17	6	7	8	9	10	11	12	13	14	2289
111	7	16	17	18	7	8	9	10	11	12	13	14	15	1754
111	8	17	18	19	8	9	10	11	12	13	14	15	16	2029
111	9	18	19	20	9	10	11	12	13	14	15	16	17	1874
111	10	19	20	21	10	11	12	13	14	15	16	17	18	2211

MAXIMUM VOLUMES FOR PERIOD 1 OF 10 YEARS OF SYNTHETIC FLOWS

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV MO
110	1	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV MO
110	2	11	12	13	2	3	4	5	6	7	8	9	10	1-MO	6-MO	54-MO	AV MO
110	3	12	13	14	3	4	5	6	7	8	9	10	11	1-MO	6-MO	54-MO	AV MO
110	4	13	14	15	4	5	6	7	8	9	10	11	12	1-MO	6-MO	54-MO	AV MO
110	5	14	15	16	5	6	7	8	9	10	11	12	13	1-MO	6-MO	54-MO	AV MO
110	6	15	16	17	6	7	8	9	10	11	12	13	14	1-MO	6-MO	54-MO	AV MO
110	7	16	17	18	7	8	9	10	11	12	13	14	15	1-MO	6-MO	54-MO	AV MO
110	8	17	18	19	8	9	10	11	12	13	14	15	16	1-MO	6-MO	54-MO	AV MO
110	9	18	19	20	9	10	11	12	13	14	15	16	17	1-MO	6-MO	54-MO	AV MO
110	10	19	20	21	10	11	12	13	14	15	16	17	18	1-MO	6-MO	54-MO	AV MO
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV MO
111	1	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV MO
111	2	11	12	13	2	3	4	5	6	7	8	9	10	1-MO	6-MO	54-MO	AV MO
111	3	12	13	14	3	4	5	6	7	8	9	10	11	1-MO	6-MO	54-MO	AV MO
111	4	13	14	15	4	5	6	7	8	9	10	11	12	1-MO	6-MO	54-MO	AV MO
111	5	14	15	16	5	6	7	8	9	10	11	12	13	1-MO	6-MO	54-MO	AV MO
111	6	15	16	17	6	7	8	9	10	11	12	13	14	1-MO	6-MO	54-MO	AV MO
111	7	16	17	18	7	8	9	10	11	12	13	14	15	1-MO	6-MO	54-MO	AV MO
111	8	17	18	19	8	9	10	11	12	13	14	15	16	1-MO	6-MO	54-MO	AV MO
111	9	18	19	20	9	10	11	12	13	14	15	16	17	1-MO	6-MO	54-MO	AV MO
111	10	19	20	21	10	11	12	13	14	15	16	17	18	1-MO	6-MO	54-MO	AV MO

TEST DATA - 723-X6-L2340  
MONTHLY STREAMFLOW SIMULATION - NOV 1970  
STATISTICS FURNISHED

IYRA IMNTH IANAL MXRCS NYRG NYMXG NPASS IPCHQ IPCHS NSTA NCJMB NTNDM NCSTY IGREL NPROJ IYRPJ MTHPJ LYRPJ  
-0 10 -0 -0 -0 -0 10 10 -0 -0 -0 3 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0

GENERATED FLOWS FOR PERIOD 1

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
107	1	4	11	12	1	28	77	30	15	10	3	1	9	427
107	2	8	3	237	18	44	22	9	19	4	2	1	0	361
107	3	1	2	236	13	18	61	17	18	8	3	1	0	154
107	4	1	2	19	6	24	74	30	14	7	3	1	0	199
107	5	1	2	21	23	25	89	34	14	10	3	1	1	230
107	6	1	2	15	35	34	67	18	13	5	2	1	0	163
107	7	1	2	10	8	28	111	38	18	7	2	1	0	264
107	8	1	2	25	31	25	106	27	15	6	2	1	0	388
107	9	1	1	43	157	25	47	14	12	4	2	1	0	117
107	10	0	1	4	14	25	75	24	12	4	2	1	0	162
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
110	1	16	11	12	1	20	3	4	5	6	7	8	9	911
110	2	26	8	26	16	9	64	98	224	214	185	31	9	258
110	3	3	4	28	4	17	22	31	63	45	11	5	6	457
110	4	5	6	8	14	19	24	48	145	125	48	15	6	588
110	5	5	6	10	16	22	76	89	131	137	71	18	10	832
110	6	4	4	9	18	17	73	96	191	267	121	20	7	341
110	7	4	5	8	4	17	47	54	90	80	12	5	4	594
110	8	15	4	12	28	29	79	129	126	126	36	13	8	498
110	9	17	8	13	66	28	52	74	107	88	32	10	3	232
110	10	3	4	4	4	14	24	41	73	46	10	6	3	341
110	10	2	3	5	7	20	52	67	83	64	24	6	8	341

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
111	1	76	40	104	47	59	250	284	033	991	1354	169	63	4070
111	2	114	50	100	13	29	69	163	295	297	88	46	42	1306
111	3	13	14	28	33	56	123	209	613	606	305	102	46	2148
111	4	27	21	30	43	70	227	294	507	572	327	168	71	2357
111	5	22	19	36	54	76	222	344	690	843	596	135	47	3084
111	6	05	24	30	13	57	113	208	443	383	130	24	24	1514
111	7	22	17	28	82	103	271	373	643	594	252	109	61	2555
111	8	02	31	42	181	76	217	215	535	492	201	87	19	2178
111	9	18	15	15	15	46	99	177	386	323	88	39	19	1240
111	10	9	13	19	24	71	168	281	363	411	144	46	52	1601

# MAXIMUM VOLUMES FOR PERIOD 1 OF 10 YEARS OF SYNTHETIC FLOWS

STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV	MO
107	8	3	237	157	44	111	38	19	10	3	1	1	237	405	1346	21	21
110	26	8	28	66	29	79	129	224	267	185	31	10	267	816	2951	42	42
111	114	50	104	181	103	271	373	690	991	1354	169	71	1354	3681	12588	184	184

# MINIMUM VOLUMES

STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV	MO
107	0	1	2	6	18	22	9	12	4	2	1	0	0	8	751	21	21
110	2	3	4	4	9	22	31	63	45	10	5	3	2	26	1712	42	42
111	9	13	15	13	29	69	163	295	297	88	24	19	9	123	7668	184	184

TEST DATA - 723-X6-L2340  
MONTHLY STREAMFLOW SIMULATION - NOV 1970  
GENERALIZED STATISTICS FURNISHED

IYRA	IMNTH	IANAL	MXRCS	NYRG	NYMXG	NPASS	IPCHG	IPCHS	NSTA	NCOB	NTNDM	NCSTY	IGNRL	NPROJ	IYRPJ	MTHPJ	LYRPJ	
-0	10	-0	-0	10	10	-0	-0	-0	3	-0	-0	-0	1	-0	-0	-0	-0	
INCONSISTENT CORREL MATRIX ADJUSTED 0 1 2 1.194																		
INCONSISTENT CORREL MATRIX ADJUSTED 0 1 2 1.094																		
INCONSISTENT CORREL MATRIX ADJUSTED 0 1 2 1.011																		

RAW CORRELATION COEFFICIENTS FOR MONTH 10

STA	107	110	111
WITH CURRENT MONTH			
107	1.000	.741	.744
110	.741	1.000	.965
111	.744	.965	1.000
WITH PRECEDING MONTH AT ABOVE STATION			
107	.681	.567	.570
110	.567	.913	.838
111	.570	.838	.913

RAW CORRELATION COEFFICIENTS FOR MONTH 11

STA	107	110	111
WITH CURRENT MONTH			
107	1.000	.741	.744
110	.741	1.000	.965
111	.744	.965	1.000
WITH PRECEDING MONTH AT ABOVE STATION			
107	.531	.567	.570
110	.567	.913	.838
111	.570	.838	.913

NOTE: Remaining months not shown

GENERATED FLOWS FOR PERIOD 1

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
107	1	2	9	29	13	31	25	24	10	3	1	1	1	149
107	2	1	3	14	17	53	72	32	24	7	3	1	1	218
107	3	1	2	6	5	9	15	9	13	6	4	0	1	73
107	4	1	4	7	11	20	30	36	13	9	2	1	0	134
107	5	0	2	11	20	25	58	80	22	9	2	1	0	231
107	6	1	1	3	3	22	44	18	5	2	1	0	0	100
107	7	1	1	6	12	27	43	60	37	9	2	1	1	200
107	8	2	2	5	48	30	34	9	8	3	2	1	1	145
107	9	0	1	2	4	14	20	14	5	2	3	1	0	66
107	10	0	2	6	9	20	14	14	5	2	2	1	1	76

STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
110	1	14	21	34	34	40	49	94	286	63	25	7	9	670
110	2	15	4	13	13	23	39	147	411	299	129	29	3	1122
110	3	10	10	13	13	20	17	28	200	83	50	16	6	462
110	4	6	8	13	23	37	50	84	166	191	110	47	13	748
110	5	10	7	20	31	39	53	105	273	190	25	15	6	804
110	6	7	6	9	8	22	42	208	238	95	25	5	3	668
110	7	3	2	8	31	72	72	126	268	137	28	16	7	770
110	8	6	10	12	32	40	41	33	105	59	34	20	5	397
110	9	5	4	6	17	15	17	46	97	46	35	20	6	306
110	10	6	5	12	17	27	23	42	51	60	37	12	8	300
STA	YEAR	10	11	12	1	2	3	4	5	6	7	8	9	TOTAL
111	1	57	90	98	105	131	217	356	950	318	183	51	9	2539
111	2	14	22	32	45	89	132	633	1508	1034	708	235	33	4348
111	3	38	40	29	29	62	81	141	861	526	223	109	96	1997
111	4	31	35	34	54	132	221	383	649	619	478	305	58	1997
111	5	45	39	55	95	148	222	546	1259	749	283	105	97	3038
111	6	26	23	25	25	70	104	586	940	326	184	32	48	3594
111	7	16	12	15	64	217	311	576	1462	701	196	111	30	2371
111	8	33	38	33	93	119	158	132	490	272	165	129	73	3754
111	9	24	19	17	27	53	68	191	400	180	172	114	42	1704
111	10	26	29	32	57	106	99	210	190	263	170	91	52	1325

# MAXIMUM VOLUMES FOR PERIOD 1 OF 10 YEARS OF SYNTHETIC FLOWS

STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV MO
107	10	11	12	1	2	3	4	5	6	7	8	9	1	216	798	12
110	12	9	29	48	53	72	80	37	9	4	1	1	80	1053	3759	52
111	14	21	34	34	72	72	208	411	299	129	47	13	411	4049	15176	217
111	57	90	98	105	217	311	633	1462	1034	708	305	97	1462			

# MINIMUM VOLUMES

STA	10	11	12	1	2	3	4	5	6	7	8	9	1-MO	6-MO	54-MO	AV MO
107	10	11	12	1	2	3	4	5	6	7	8	9	1	216	798	12
110	0	1	2	3	9	14	9	5	2	1	0	0	0	6	513	
111	3	2	6	8	15	17	28	51	46	25	5	3	2	43	2200	
111	14	12	15	25	53	68	132	190	180	165	32	30	12	168	9433	





## EXHIBIT 5

## DEFINITIONS - 723-X6-12340

AC1	- Alienation coefficient for station 1
AC2	- Alienation coefficient for station 2
AC3	- Alienation coefficient for station 3
ADJ	- Plus sign indicates value smaller than upstream sum by tandem test
ADJ1	- Equal sign indicates value adjusted by tandem test
ALCFT(I,K)	- Alienation coefficient array
ALOG	- Computer library function of natural logarithm
ANLOG	- Number of logarithms
ANYRS	- Number of years of record
AV(I,K)	- Mean logarithm
AVG(I,K)	- Average of the generated deviates
AVGQ(I)	- Average monthly flow for a station
AVMN(I)	- Average logarithm of flow for minimum 3 consecutive months
AVMX(I)	- Average logarithm of flow for maximum 3 consecutive months
B(L)	- Beta coefficient
BETA(I,K,L)	- Beta coefficient for generation equation
BLANK	- Blank space
CROUT	- Program subroutine to solve simultaneous equations
CSTAC(KX,K)	- Coefficient by which flows are multiplied before adding in a combination
DABS	- Computer library function of absolute value of double precision number
DQ(I,K)	- Increment of flow
DTRMC	- Determination coefficient
E	- Letter E indicates estimated value
FAC	- Temporary factor
I	- Index for calendar month
IA	- Indicator in column 1 of first card for each job
IANAL	- Indicator, positive value calls for analysis
IENDF	- End of file indicator
IGNRL	- Indicator, + 2 calls for computing generalized statistics and + 1 or + 2 calls for using generalized statistics for generating flows
IMN(I)	- Month sequence number of last month of 3 driest consecutive months
IMNTH	- Calendar month number for first month of water year
IMX(I)	- Month sequence number of last month of 3 wettest consecutive months
INDC	- Transfer indicator
IP	- Month number for preceding month
IPASS	- Sequence number of pass (subset of stations)
IPCHQ	- Indicator, positive value calls for writing discharges on tape
IPCHS	- Indicator, positive value calls for punching statistics
IQ(I)	- Fixed-point conversion of flow values

IQTAP	- Tape number for storing flows
IRCON	- Indicator, positive value calls for flow reconstitution
ISKZ	- Positive value calls for varying flow increment (DQ) to make skew zero.
IST(K,L)	- Sequence number of upstream station for tandem test
ISTA(K)	- Station number
ISTAC(KX,K)	- Station number in a combination
ISTAN	- Temporary station number
ISTAP	- Station sequence number for all passes
ISTAT	- Tape number for storing statistics
ISTN(L)	- Station number of downstream tandem station
ISTT(K,L)	- Station number of upstream tandem station
ISTX(L)	- Station number of independent station for consistences test
ISTY(L)	- Station number of dependent station for consistences test
ITEMP	- Temporary variable
ITMP	- Temporary variable
ITMPP	- Temporary variable
ITP	- Temporary variable
ITRNS	- Transfer indicator
IX	- Temporary variation of I
IXX	- Argument for random number function
IYR	- Number of current year
IYRA	- First year of data
IYRPJ	- Year of start of flow projection
J	- Index for year
JA	- Sequence number of projection year
JTMP(L)	- Matrix column number
JTP	- Matrix column number
JX	- Temporary variation of J
JXTMP	- Temporary variation of J
K	- Index for station
KM	- Dimension limit for number of consecutive months
KPASS	- Dimension limit for number of passes
KSTA	- Dimension limit for total number of stations
KSTAC(KX,K)	- Index number of station in a combination
KSTAP	- Dimension limit for total number of stations
KX	- Temporary variation of K or combination sequence
KYR	- Dimension limit for number of consecutive years
L	- Index for related station
LA	- Temporary variation of L
LQTAP	- Number of records up to present position on tape IQTAP
LSTAT	- Number of records up to present position on tape ISTAT
LTMP(L)	- Matrix row number
LTP	- Matrix row number
LTRA	- Letter A
LX	- Temporary variation of L
LYRPJ	- Last year of each projection
M	- Serial number of month
MA	- Sequence number of month of projected flow

MO(I)	- Calendar month number
MPASS	- Temporary counter for number of passes
MTHPJ	- Calendar month of start of each projection
MXRCS	- Number of years in each period for which maximum and minimum recorded and reconstituted flows are desired
N	- Serial number of period of flows
NC	- Counter to prevent continuous looping
NCA	- Counter to prevent continuous looping
NCAB(I,K,L)	- Number of values and cross products used to compute correlation coefficients
NCB	- Transfer indicator
NCOMB	- Number of combinations of stations max. and min. quantities are to be computed
NCSTY	- Number of consistency tests
NINDP	- Number of independent variables in regression study
NJ	- Number of years in computation sequence
NLOG(I,K)	- Number of logarithms used to compute frequency statistics
NMNMX	- Number of months following dry season and preceding wet season
NMXMN	- Number of months following wet season and preceding dry season
NPASS	- Total number of passes in job
NPROJ	- Number of projections of future flows from present conditions
NQ	- Counter for number of flows
NQTAP	- Total number of records saved on tape IQTAP
NSMX(L)	- Number of upstream stations in tandem test
NSTA	- Number of stations in analysis
NSTAA	- NSTA + 1
NSTAC(KX)	- Number of stations in a combination
NSTAT	- Total number of records saved on tape ISTAT
NSTAX	- NSTA + NSTA
NSTNP(I)	- Number of stations in a particular pass
NSTX	- Number of stations in current pass that occurred in preceding passes
NSTXX	- NSTX + 1
NSUM(K)	- Number of stations upstream from a station for tandem test
NTNDM	- Number of tandem tests
NVAR	- Total number of variable in regression study
NYMXG	- Number of years of generated flows in each period for which maximum and minimum flows are desired
NYRG	- Total number of years of generated flows
NYRS	- Number of years of recorded flows
Q(M,K)	- Monthly flow
QM(I)	- Monthly flow
QMIN(I,K)	- Minimum flow
QPREV(I)	- Flow for previous month
QR(M,K)	- Identification symbol
QSTAP(I)	- Temporary storage of QPREV
R(K,L)	- Correlation coefficient in a given matrix
RA(I,K,L)	- Correlation coefficient
RAV(K,L)	- Average correlation coefficient for 12 calendar months

RMAX	- Maximum consistent correlation coefficient
RMIN	- Minimum consistent correlation coefficient
RNGEN(IXX)	- Program random number function
R1	- Correlation coefficient being tested
R2	- Correlation coefficient being tested
R3	- Correlation coefficient being tested
SD(I,K)	- Standard deviation of logarithms for calendar month
SDAV(K)	- Average standard deviation for 12 consecutive months
SDV(I,K)	- Standard deviation of the generated deviates
SKEW(I,K)	- Skew coefficient of logarithms for calendar month
SMQ(J,K)	- Maximum or minimum flow for month or duration
SQA(I,K,L)	- Sum of squares of first variable
SQB(I,K,L)	- Sum of squares of second variable
SUM	- Average correlation coefficient of matrix
SUMA(I,K,L)	- Sum of first variable
SUMB(I,K,L)	- Sum of second variable
T	- Large positive constant
TEMP	- Temporary variable
TMP	- Temporary variable
TMPA	- Temporary variable
TMPB	- Temporary variable
TMPP	- Temporary variable
TP	- Temporary variable
X(I)	- Value of independent variable in regression equation
XINCR(I)	- Iteration value for flow increment
XPAB(I,K,L)	- Sum of cross products of first and second variables

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C      723-Y6-L2340 MONTHLY STEAMFLOW SIMULATION REC, C OF E, USA NOV 1970
CA * * * * * LIBRARY FUNCTIONS ALOG, DAHS * * * * * 1002
C      PROGRAM SUBROUTINE CRGUT, RGEN -- SEE COMMENTS IN RGEN 1003
C INDEXES I=CALENDAR MONTH J=YEAR K=STA L=RELATED STA M=SUCCESSIVE MONTH 1004
C
C      DIMENSION
C      .B(10),H(10,11),
C      .ALCFT(12,10),AV(12,10),AVG(12,10),AVGR(10),AVMN(10),AVMX(10),
C      .BETA(12,10,10),DD(12,10),IMN(10),IMX(10),IQ(15),
C      .ISTA(10),JTMP(9),LTMP(10),PO(12),NCAB(12,10,20),
C      .NLDR(12,10),D(1201,10),GM(12),GMIN(12,10),GPREV(10),GR(1201,10),
C      .QSTAP(100),RA(12,10,20),RAV(10,10),SD(12,10),SDAV(10),SDV(12,10),
C      .SKEW(12,10),SHQ(30,10),SGA(12,10,20),SQR(12,12,20),SUMA(12,10,20),
C      .SUMB(12,10,20),X(10),XINCR(12),XPAB(12,10,20),
C      .CSTAC(2,10,5),ISTAC(2,10),ISTN(10),ISTT(10,10),ISTX(10),
C      .ISTY(10),KSTAC(2,10,5),NSMX(10),NSTAC(2,5),NSTNP(5),
C      .NSUM(10,5),MCOMB(5),MTNOM(5),IST(10,10,5)
C      DOUBLE PRECISION R,B
C      COMMON DTRMC,NINDP,B
C      DATA LTRA/1HA/,BLANK/1H /,E/1HE/,ADJ/1H+/,ADJ1/1H+
10 FORMAT(1H1)
20 FORMAT(1X,I5,19I6)
30 FORMAT(1X,I7,9I8)
40 FORMAT(1X,A3,9A4,10A4)
50 FORMAT(1X,I3,I4,12F6.0)
60 FORMAT(1X,F7.0,9F8.0)
70 FORMAT(1X,I3,I4,12F6.3)
80 FORMAT(1X,I7,12F6.3)
90 FORMAT(1X,I7,12F6.1)
100 FORMAT(1X,I4,I6,12I8,110)
110 FORMAT(A1,A3,9A4,10A4)
120 FORMAT(1X,I7,3F6.3,2I6)
130 FORMAT(/23H GENERALIZED STATISTICS//13H ST1 ST2 RAV)
140 FORMAT(/38H STA AVMX AVMN SDAV MAXMU MINMU)
C      ISTAT=8
C      IQTAP=9
C      KPASS=5
C      KSTAP=100
C      KSTA=10
C      KYR=100
C      KMEKYR=12+1
C      NSTA=0
C      WASTE CARDS UNTIL AN A IN COLUMN 1, FIRST TITLE CARD
C      ** CARD A **
150 READ(5,110) IA,(SHQ(M,1),M=1,20)
C      IF (IA.NE.LTRA) GO TO 150
C      WRITE(6,10)
C      READ(5,40)((SHQ(M,K),M=1,20),K=2,3)
C      WRITE(6,40)((SHQ(M,K),M=1,20),K=1,3)
C      ** CARD B CARD C **
C      READ(5,30)IYRA,IMNTH,IANAL,MXRCB,NYRG,NYMXG,NPASS,IPCHQ,IPCHS,NSTA
C      1,NCOMB,NTNOM,NCSTY,IGNRL,NPROJ,IYRPJ,MTMPJ,LYRPJ
C      TERMINATE WITH 5 PLANK CARDS, AN A IN COL 1 OF FIRST
C      ITHP=IANAL+NYRG
C      IF(IJTMP.GT.0)GO TO 180
C      STOP
160 WRITE(6,170) NYRS,NSTA,NCOMB,NPASS
170 FORMAT(/19H DIMENSION EXCEEDED ,5X,4HNYS,I4,5X,4HNSTA,I3,5X,
15HNCOMB,I3,5X,5HPASS,I3)
C      GO TO 150
180 WRITE(6,190)
190 FORMAT(/108H IYRA IMNTH IANAL MXRCB NYRG NYMXG NPASS IPCHQ IPCHS
1 NSTA NCOMB NTNOM NCSTY IGNRL NPROJ IYRPJ MTMPJ LYRPJ )
C      WRITE(6,20) IYRA,IMNTH,IANAL,MXRCB,NYRG,NYMXG,NPASS,IPCHQ,IPCHS,
C      INSTA,NCOMB,NTNOM,NCSTY,IGNRL,NPROJ,IYRPJ,MTMPJ,LYRPJ
C      IF (LYRPJ-IYRA,GE,KYR) GO TO 160
CB * * * * * SET CONSTANTS * * * * *
C      IXX=0
C      NSTAA=NSTA+1
C      NSTAX=NSTA+NSTA
C      Y=99999999.
C      IYRA=IYRA-1

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IMNTH=IMNTH+1	1076
NSTX=0	1077
NSTXX=1	1078
IPASS=1	1079
REWIND ISTAT	1080
NSTAT=0	1081
LSTAT=0	1082
REWIND IQTAP	1083
NOTAP=0	1084
LOTAP=0	1085
DO 195 J=1,KPASS	
MCOMB(J)=0	
MTNDM(J)=0	
195 CONTINUE	
GO TO 270	1086
C       SAVE STATIONS FROM PREVIOUS PASSES IF NECESSARY	1087
200 IPASS=IPASS+1	1088
WRITE(6,10)	1089
IF (IPASS.GT.KPASS) GO TO 160	1090
C       ** CARD J **	1091
READ(5,30)NCOMB,MTNDM,NCSTY,NSTX,(ISTA(K),K=1,NSTX)	
WRITE(6,210) IPASS,(ISTA(K),K=1,NSTX)	1093
210 FORMAT(5HOPASS ,13/28H STA(9) FROM PREVIOUS PASSES ,10I6)	1094
NSTXX=NSTX+1	1095
REWIND IQTAP	1096
LOTAP=0	1097
REWIND ISTAT	1098
MPASS=1	1099
READ (ISTAT)	1100
LSTAT=1	1101
ITP=NYRS*12+1	1102
ITEMP=NSTNP(MPASS)	1103
ITMPP=0	1104
DO 250 K=1,NSTX	1105
220 READ(IQTAP)ITMP,(Q(M,K),M=1,ITP)	1106
LOTAP=LOTAP+1	1107
IF (ISTA(K).NE.ITMP) GO TO 220	1108
230 ITMPP=ITMPP+1	1109
IF (ITMPP.GT.ITEMP) GO TO 240	1110
READ (ISTAT)ITMP,(AV(I,K),SD(I,K),SKEW(I,K),DO(I,K),(BETA(I,K,L),L	1111
I=1,ITEMP),ALCFT(I,K),I=1,12)	1112
LSTAT=LSTAT+1	1113
IF (ITMP.EQ.ISTA(K)) GO TO 250	1114
GO TO 230	1115
240 READ(ISTAT)	1116
LSTAT=LSTAT+1	1117
MPASS=MPASS+1	1118
ITEMP=NSTNP(MPASS)	1119
ITMPP=0	1120
GO TO 230	1121
250 CONTINUE	1122
DO 260 K=1,NSTX	1123
NSUM(K,IPASS)=0	
DO 260 I=1,12	
260 NLOG(I,K)=NYRS	1125
270 IF (IANAL.GT.0) NSTA=NSTX	1126
DO 280 I=1,12	1127
MO(I)=IMNTH+I	1128
IF (MO(I).LT.13) GO TO 260	1129
MO(I)=MO(I)-12	1130
280 CONTINUE	1131
IF (NCOMB.LE.0) GO TO 320	1132
MCOMB(IPASS)=NCOMB	1133
C       IDENTIFY STATION COMBINATIONS	1134
DO 300 K=1,NCOMB	1135
C       ** CARD D **	1136
READ(5,30)ITP,(ISTAC(K,L),L=1,ITP)	1137
WRITE (6,290) K,ITP,(ISTAC(K,L),L=1,ITP)	1138
290 FORMAT (/5H COMB,12,5H STA,15I8)	1139000
NSTAC(K,IPASS)=ITP	
C       ** CARD E **	1141
READ(5,60) TEMP,(CSTAC(K,L,IPASS),L=1,ITP)	

300	WRITE(6,310) (CSTAC(K,L,IPASS),L=1,ITP)	1144000
310	FORMAT (7X,5HRATIO,8X,14F8.3)	1145
320	IF(NTNDM.LE.0) GO TO 350	
	NTNDM(IPASS)=NTNDM	1146
	DO 340 LX=1,NTNDM	1147
C	READ(5,30) ISTN(LX),ITMP,(ISTT(LX,L),L=1,ITMP)	1148
	WRITE(6,330) LX,ISTN(LX),(ISTT(LX,L),L=1,ITMP)	1149
330	FORMAT (/13H TANDEM GROUP,13.6X,14H00HNSSTREAM STA,15.6X,	1150000
	115HUPSTREA STA(S),10I5)	1151000
340	NSHX(LX)=ITMP	1152
350	IF(IPASS.EQ.1)NYRS=0	1153
	DO 360 K=NSTXX,KSTA	1154
	NSUM(K,IPASS)=0	
	ISTA(K)=1000-K	1156
C	INITIATE -1, NO RECORD FOR ALL FLOWS	1157
	DO 360 M=1,KM	1158
360	F(M,K)=-1.	1159
	DO 370 I=1,12	1160
	NLOG(I,K)=0	1161
	DO(I,K)=0.	1162
	QMIN(I,K)=T	1163
370	CONTINUE	1164
380	CONTINUE	1165
	IF(NCSTY.LE.0) GO TO 420	1166
	WRITE(6,390)	1167
390	FORMAT(/30X,8HSTATIONS/17H CONSISTENCY TEST,5X,23HINDEPENDENT DE	1168
	PENDENT)	1169
	DO 400 L=1,NCSTY	1170
C	READ (5,30) ISTX(L),ISTY(L)	1171
	WRITE(6,410) L,ISTX(L),ISTY(L)	1172
400	FORMAT(13X,13.8X,15.8X,15)	1173
410	IF(IALAL.LE.0)GO TO 1570	1174
420	IF(IALAL.LE.0)GO TO 1570	1175
CC	* * * * * READ AND PROCESS 1 STATION-YEAR OF DATA * * * * *	1176
C	READ(5,50) ISTAN,IYR,(QH(I),I=1,12)	1177
	IF(ISTAN.LT.1)GO TO 500	1178
	IF(NSTA.LT.1)GO TO 450	1179
C	BLANK CARD INDICATES END OF FLOW DATA	1180
	IF(ISTAN.LT.1)GO TO 500	1181
	IF(NSTA.LT.1)GO TO 450	1182
C	ASSIGN SUBSCRIPT TO STATION	1183
	DO 440 K=NSTXX,NSTA	1184
	IF(ISTAN.EQ.ISTA(K))GO TO 460	1185
440	CONTINUE	1186
450	NSTA=NSTA+1	1187
	IF(NSTA.GT.KSTA) GO TO 160	1187-2*
	K=NSTA	1188
	ISTA(K)=ISTAN	1189
C	ASSIGN SUBSCRIPT TO YEAR	1190
	J=IYR-IYRA	1191
460	IF(NYRS.LT.J.AND.IPASS.EQ.1)NYRS=J	1192
	IF(J.GT.0.AND.J.LE.NYRS) GO TO 480	1193
	WRITE (6,470)IYR	1194
470	FORMAT (/18H UNACCEPTABLE YEAR,15)	1195000
	GO TO 150	1196
C	STORE FLOWS IN STATION AND MONTH ARRAY	1197
	M=J+12-11	1198
480	DO 490 I=1,12	1199
	M=M+1	1200
	IF(QH(I).LE.(-1.)) GO TO 490	1201
	IF(QH(I).LT.QMIN(I,K)) QMIN(I,K)=QH(I)	1202
	NLOG(I,K)=NLOG(I,K)+1	1203
	DO(I,K)=DO(I,K)+QH(I)	1204
	Q(M,K)=QH(I)	1205
490	CONTINUE	1206
	GO TO 430	1207
500	NSTAA=NSTA+1	1208
	IF (NYRS.GT.KYR.OR.NSTA+NCOMB.GT.KSTA) GO TO 160	1209
	IF(NSTA.LE.0) GO TO 160	1210
	NSTNP(IPASS)=NSTA	1211
	NSTAX=NSTA+NSTA	1212

	IF(NCOMB.LE.0)GO TO 540	1213
C	IDENTIFY STA SUBSCRIPTS FOR STAS IN COMBINATIONS	1214
	DO 530 KX=1,NCOMB	1215
	ITP=NSTAC(KX,IPASS)	
	LX=0	1217
	DO 520 L=1,ITP	1218
	ITEMP=ISTAC(KX,L)	1219
	DO 510 K=1,NSTA	1220
	IF(ISTA(K).NE.ITEMP)GO TO 510	1221
	LX=LX+1	1222
	KSTAC(KX,LX,IPASS)=K	
	GO TO 520	1224
	510 CONTINUE	1225
	520 CONTINUE	1226
C	REDUCE STATIONS TO THOSE IDENTIFIABLE	1227
	NSTAC(KX,IPASS)=LX	
	530 CONTINUE	1229
C	IDENTIFY STATIONS IN TANDEM	1230
	540 IF(NTNOM.LE.0) GO TO 600	1231
	DO 590 LX=1,NTNOM	1232
	DO 550 K=1,NSTA	1233
	IF(ISTA(K).EQ.ISTN(LX)) GO TO 560	1234
	550 CONTINUE	1235
	560 ISTN(LX)=K	1236
	NSUM(K,IPASS)=NSHX(LX)	
	ITMP=NSHX(LX)	1238
	DO 580 L=1,ITMP	1239
	DO 570 KX=1,NSTA	1240
	IF(ISTA(KX).EQ.ISTT(LX,L)) GO TO 580	1241
	570 CONTINUE	1242
	580 IST(K,L,IPASS)=KX	
	590 CONTINUE	1244
C	IDENTIFY PAIRS OF STATIONS FOR CONSISTENCY TESTS	1245
	600 IF(NCSTY.LE.0) GO TO 630	1246
	DO 640 L=1,NCSTY	1247
	DO 630 K=1,NSTA	1248
	IF(ISTA(K).EQ.ISTX(L)) GO TO 610	1249
	IF(ISTA(K).EQ.ISTY(L)) GO TO 620	1250
	GO TO 630	1251
	610 ISTX(L)=K	1252
	GO TO 630	1253
	620 ISTY(L)=K	1254
	630 CONTINUE	1255
	640 CONTINUE	1256
	650 ITMP=NSTA+NCOMB	1257
CD	***** MAX AND MIN RECORDED VOLUMES *****	1258
C	INITIATE SUMS	1259
	DO 790 K=NSTXX,ITMP	1260
	AVGQ(K)=0.	1261
	NQ=0	1262
	DO 660 I=1,15	1263
	660 SHQ(I,K)=0	1264
	DO 670 J=16,30	1265
	670 SHQ(I,K)=T	1266
	TMP=0.	1267
	TMPA=0.	1268
	M=1	1269
	N=0	1270
	DO 780 J=1,NYRS	1271
	DO 770 I=1,12	1272
	M=M+1	1273
	N=N+1	1274
	IF(K.LE.NSTA)GO TO 700	1275
C	COMPUTE COMBINED FLOWS	1276
	KX=K-NSTA	1277
	ITP=NSTAC(KX,IPASS)	
	Q(M,K)=0.	1279
	DO 690 L=1,ITP	1280
	ITEMP=KSTAC(KX,L,IPASS)	
C	COMBINED FLOW MISSING	1282
	IF(Q(M,ITEMP).EQ.-1..OR.Q(M,K).EQ.-1.) GO TO 680	1283
	Q(M,K)=Q(M,K)+Q(M,ITEMP)+CSTAC(KX,L,IPASS)	



	GO TO 690	1285
680	Q(M,K)=-1.	1286
690	CONTINUE	1287
700	IF(Q(M,K).NE.-1.) GO TO 710	1288
C	START NEW ACCUMULATIONS WHEN FLOW MISSING	1289
	N=0	1290
	TMP=0.	1291
	TMPA=0.	1292
	GO TO 770	1293
710	TEMP=Q(M,K)	1294
C	1-MONTH FLOWS	1295
	IF(SMQ(I,K).LT.TEMP)SMQ(I,K)=TEMP	1296
	IF(SMQ(I+15,K).GT.TEMP)SMQ(I+15,K)=TEMP	1297
	IF(SMQ(13,K).LT.TEMP)SMQ(13,K)=TEMP	1298
	IF(SMQ(28,K).GT.TEMP)SMQ(28,K)=TEMP	1299
C	6-MONTH FLOWS	1300
	TMP=TMP+TEMP	1301
	TMPA=TMPA+TEMP	1302
	IF(N=6)760,730,720	1303
720	TMP=TMP-Q(M=6,K)	1304
730	IF(TMP.LT.SMQ(29,K))SMQ(29,K)=TMP	1305
	IF(TMP.GT.SMQ(14,K))SMQ(14,K)=TMP	1306
C	54-MONTH FLOWS	1307
	IF(N=54)760,750,740	1308
740	TMPA=TMPA-Q(M=54,K)	1309
750	IF(TMPA.LT.SMQ(30,K))SMQ(30,K)=TMPA	1310
	IF(TMPA.GT.SMQ(15,K))SMQ(15,K)=TMPA	1311
C	AVERAGE FLOW	1312
760	AVGO(K)=AVGO(K)+TEMP	1313
	NQ=NQ+1	1314
770	CONTINUE	1315
780	CONTINUE	1316
	TEMP=NQ	1317
	AVGO(K)=AVGO(K)/TEMP	1318
790	CONTINUE	1319
	WRITE(6,800)	1320
800	FORMAT(/34H MAXIMUM VOLUMES OF RECORDED FLOWS)	1321
	WRITE(6,810)(MO(I),I=1,12)	1322
810	FORMAT (5H STA,12I7,33H 1-MO 6-MO 54-MO AV MO)	1323000
	ITMP=NSTA+NCOMB	1324
	DO 830 K=NSTXX,ITMP	1325
	ITEMP=AVGO(K)+.5	1326
	DO 820 I=1,15	1327
820	ID(I)=SMQ(I,K)+.5	1328
830	WRITE(6,840)ISTA(K),(ID(I),I=1,15),ITEMP	1329
840	FORMAT(1X,I4,12I7,2I8,19,I8)	1330
	WRITE(6,850)	1331
850	FORMAT(/16H MINIMUM VOLUMES)	1332
	WRITE(6,810)(MO(I),I=1,12)	1333
	DO 870 K=NSTXX,ITMP	1334
	DO 860 I=1,15	1335
860	ID(I)=SMQ(I+15,K)+.5	1336
870	WRITE(6,840)ISTA(K),(ID(I),I=1,15)	1337
CE	***** COMPUTE FREQUENCY STATISTICS *****	1338
	WRITE (6,880)	1339
880	FORMAT (/21H FREQUENCY STATISTICS)	1340
	WRITE(6,890)(MO(I),I=1,12)	1341
890	FORMAT (/14H STA ITEM,I7,11I8)	1342000
C	MISSING FLOW PRECEDING FIRST RECORD MONTH	1343
	DO 900 K=NSTXX,NSTA	1344
900	Q(I,K)=T	1345
	IPCON=0	1346
	ITEMP = NSTA	1346100
	DO 1180 K=1,ITEMP	1347000
	IF (ITEMP.GT.NSTA) GO TO 1180	1347100
	IF(K.LE.NSTX) GO TO 942	1347-2
910	DO 920 I=1,12	1348
	TEMP=NLOG(I,K)	1349
	DG(I,K)=DG(I,K)*.01/TEMP	1350
	IF(DG(I,K).LT..1) DG(I,K)=.1	1351
	IF(DMIN(I,K).LT.0.) DG(I,K)=DG(I,K)-DMIN(I,K)	1352
920	CONTINUE	1353

	N=0	1354
930	DO 940 I=1,12	1355
	AV(I,K)=0.	1356
	SD(I,K)=0.	1357
	SKEW(I,K)=0.	1358
	TMP=N	1359
	XINCR(I)=(Q(I,K)+QMIN(I,K))/(16.-TMP)	1360
940	CONTINUE	1361
942	M=1	1362
	DO 970 J=1,NYRS	1363
	DO 960 I=1,12	1364
	M=M+1	1365
	IF(Q(M,K).EQ.-1.) GO TO 950	1366
C	REPLACE FLOW ARRAY WITH LOG ARRAY	1367
	TEMP=ALOG(Q(M,K)+Q(I,K))/2.3025851	1368
	Q(M,K)=TEMP	1369
	IF(K.LE.NSTX) GO TO 960	1369-2
C	SUM, SQUARES, AND CUBES	1370
	AV(I,K)=AV(I,K)+TEMP	1371
	SD(I,K)=SD(I,K)+TEMP*TEMP	1372
	SKEW(I,K)=SKEW(I,K)+TEMP*TEMP*TEMP	1373
	GO TO 960	1374
C	MISSING FLOWS EQUATED TO T	1375
950	Q(M,K)=T	1376
	IRCON=1	1377
960	CONTINUE	1378
970	CONTINUE	1379
	IF(K.LE.NSTX) GO TO 1180	1379-2
	INDC=0	1380
	DO 1000 I=1,12	1381
	TEMP=NLOG(I,K)	1382
	IF(TEMP.LT.3.) GO TO 1120	1383
	TMP=AV(I,K)	1384
	AV(I,K)=TMP/TEMP	1385
	IF(SD(I,K).LE.0.) GO TO 980	1386
	TMPA=SD(I,K)	1387
	SD(I,K)=(SD(I,K)-AV(I,K)*TMP)/(TEMP-1.)	1388
	IF(SD(I,K).LE.0.) GO TO 980	1388-2*
	SD(I,K)=SD(I,K)**.5	1389
	IF(SD(I,K).LT..0005) GO TO 990	1390
	SKEW(I,K)=(TEMP*TEMP*SKEW(I,K)-3.*TEMP*TMP*TMPA+2.*TMP*TMP*TMP)	1391
	1/(TEMP*(TEMP-1.)*(TEMP-2.)*SD(I,K)**3)	1392
	IF(SKEW(I,K).LT.(-.1).OR.SKEW(I,K).GT..1) INDC=1	1393
	IF(SKEW(I,K).GT.3.) SKEW(I,K)=3.	
	IF(SKEW(I,K).LT.-3.) SKEW(I,K)=-3.	
	GO TO 1000	1394
980	SD(I,K)=0.	1395
990	SKEW(I,K)=0.	1396
1000	CONTINUE	1397
	M=M+1	1398
	IF(M.GT.1) GO TO 1060	1399
	WRITE(6,1010) ISTAT(K), (AV(I,K), I=1,12)	1400
1010	FORMAT (/1X,15,8H MEAN,12F8.3)	1401000
	WRITE(6,1020) (SD(I,K), I=1,12)	1402
1020	FORMAT (7X,7HSTD DEV,12F8.3)	1403000
	WRITE(6,1030) (SKEW(I,K), I=1,12)	1404
1030	FORMAT (10X,10HSEW,12F8.3)	1405000
	WRITE(6,1040) (Q(I,K), I=1,12)	1406
1040	FORMAT (8X,8HINCRMT,F7.2,11F8.2)	1407000
	WRITE(6,1050) (ALOG(I,K), I=1,12)	1408
1050	FORMAT (9X,9HYEARS,12I8)	1409000
1060	IF(N.GE.14) GO TO 1180	1410
	IF(INDC.LE.0) GO TO 1180	1411
C	THE FOLLOWING ROUTINE WILL ADJUST THE INCREMENT TO	1412
C	TRY TO OBTAIN ZERO SKEW	1413
C	CHANGE THE FOLLOWING STAT TO ISKZ=1 TO ACTIVATE	1414
	ISKZ=0	1415
	IF(ISKZ.LE.0) GO TO 1180	1416
	ITP=-11	1417
	DO 1110 I=1,12	1418
	M=ITP+I	1419
	DO 1080 J=1,NYRS	1420

	M=M+12	1421
	IF(Q(M,K).EQ.T) GO TO 1070	1422
	TEMP=Q(M,K)	1423
	Q(M,K)=10.**TMP+QQ(I,K)	1424
	GO TO 1080	1425
1070	Q(M,K)=-1.	1426
1080	CONTINUE	1427
	TEMP=SKEW(I,K)	1428
	IF(TEMP.GT.(-.1).AND.TEMP.LT..1) GO TO 1110	1429
	IF(TEMP) 1090,1110,1100	1430
1090	QQ(I,K)=QQ(I,K)*2.	1431
	GO TO 1110	1432
1100	QQ(I,K)=QQ(I,K)+XINCR(I)	1433
1110	CONTINUE	1434
	GO TO 930	1435
C	***** DELETE STATIONS WITH LESS THAN 3 YEARS OF DATA*****	1436
1120	WRITE(6,1130)ISTA(K)	1437
1130	FORMAT (/4H STA,16,28H DELETED, INSUFFICIENT DATA)	1438000
	NSTA=NSTA+1	1439
	NSTAA=NSTA+1	1440
	NSTAX=NSTA+NSTA	1441
	IF(K.GT.NSTA)GO TO 1180	1442
C	REDUCE SUBSCRIPTS OF SUBSEQUENT STATIONS	1443
	DO 1170 KX=K,NSTA	1444
	ISTA(KX)=ISTA(KX+1)	1445
	M=1	1446
	DO 1150 J=1,NYRS	1447
	DO 1140 I=1,12	1448
	M=M+1	1449
1140	Q(M,KX)=Q(M,KX+1)	1450
1150	CONTINUE	1451
	DO 1160 I=1,12	1452
	QMIN(I,KX)=QMIN(I,KX+1)	1453
	NLOG(I,KX)=NLOG(I,KX+1)	1454
1160	QQ(I,KX)=QQ(I,KX+1)	1455
1170	CONTINUE	1456
	GO TO 910	1457
1180	CONTINUE	1458
	ITRNS=0	1459
	IF(ITRNS.LE.0) GO TO 1370	1460
CF*	***** ADJUSTMENT OF FREQUENCY STATISTICS TO LONG TERM*****	1461
	DO 1190 I=1,12	1462
	DO 1190 K=1,NSTA	1463
	DO 1190 L=1,NSTAX	1464
	NCAR(I,K,L)=0	1465
	SUMA(I,K,L)=0.	1466
	SUM9(I,K,L)=0.	1467
	SQA(I,K,L)=0.	1468
	SOR(I,K,L)=0.	1469
	XPAB(I,K,L)=0.	1470
	RA(I,K,L)=-4.	1471
1190	CONTINUE	1472
	DO 1220 K=1,NSTA	1473
	KX=K+1	1474
	M=1	1475
	DO 1220 J=1,NYRS	1476
	DO 1210 I=1,12	1477
	M=M+1	1478
	TEMP=Q(M,K)	1479
	IF(TEMP.EQ.T) GO TO 1210	1480
	DO 1200 L=KX,NSTAX	1481
	LX=L-NSTA	1482
	IF(LX.LT.1) TMP=Q(M,L)	1483
	IF(LX.GT.0) TMP=Q(M+1,LX)	1484
	IF(TMP.EQ.T) GO TO 1200	1485
	NCAR(I,K,L)=NCAR(I,K,L)+1	1486
	SUMA(I,K,L)=SUMA(I,K,L)+TEMP	1487
	SUM9(I,K,L)=SUM9(I,K,L)+TMP	1488
	SQA(I,K,L)=SQA(I,K,L)+TEMP*TEMP	1489
	SOR(I,K,L)=SOR(I,K,L)+TMP*TMP	1490
	XPAB(I,K,L)=XPAB(I,K,L)+TEMP*TMP	1491
	IF(L.GT.NSTA) GO TO 1200	1492

NCAB(I,L,K)=NCAB(I,K,L)	1493
SUMA(I,L,K)=SUMB(I,K,L)	1494
SUMB(I,L,K)=SUMA(I,K,L)	1495
SQA(I,L,K)=SQB(I,K,L)	1496
SQB(I,L,K)=SQA(I,K,L)	1497
XPAB(I,L,K)=XPAB(I,K,L)	1498
1200 CONTINUE	1499
1210 CONTINUE	1500
1220 CONTINUE	1501
INDC=0	1502
DO 1260 K=1,NSTA	1503
KX=K+1	1504
DO 1260 I=1,12	1505
RA(I,K,K)=1.	1506
DO 1250 L=KX,NSTAX	1507
IF(NCAB(I,K,L).LE.2) GO TO 1250	1508
TEMP=NCAB(I,K,L)	1509
TMP=SQA(I,K,L)	1510
TP=SQB(I,K,L)	1511
TMPA=SUMA(I,K,L)	1512
TMPB=(TMP-TMPA**2/TEMP)/TEMP	1513
IF(TMPB.LT.0.) TMPB=0.	1514
SQA(I,K,L)=TMPB**5	1515
TMPB=SUMB(I,K,L)	1516
TMPB=(TP-TMPB**2/TEMP)/TEMP	1517
IF(TMPB.LT.0.) TMPB=0.	1518
SQB(I,K,L)=TMPB**5	1519
TMP=(TMP-TMPA**2/TEMP)*(TP-TMPB**2/TEMP)	1520
IF(TMP.LE.0.) GO TO 1230	1521
THPA=XPAB(I,K,L)-TMPA*TMPB/TEMP	1522
TMPB=1.	1523
IF(TMPA.LT.0.) TMPB=-TMPB	1524
TMPA=TMPA*TMPA/TMP	1525
TMPA=1.-(1.-TMPA)*(TEMP-1.)/(TEMP-2.)	1526
IF(TMPA.LT.0.) TMPA=0.	1527
RA(I,K,L)=TMPB*THPA**5	1528
ITP=I	
LA=I	
LX=L-NSTA	
IF(L.LE.NSTA) GO TO 1235	
ITP=I-1	
IF(ITP.LT.1) ITP=12	
LA=LX	
1235 IF(SD(I,K).LT..0001.OR.SD(ITP,LA).LT..0001) GO TO 1230	1529
GO TO 1240	1530
1230 RA(I,K,L)=0.	1531
1240 IF(L.GT.NSTA) GO TO 1250	1532
SQA(I,L,K)=SQB(I,K,L)	1533
SQB(I,L,K)=SQA(I,K,L)	1534
RA(I,L,K)=RA(I,K,L)	1535
1250 CONTINUE	1536
1260 CONTINUE	1537
DO 1280 K=1,NSTA	1538
DO 1280 I=1,12	1539
TEMP=NLOG(I,K)	1540
LX=0	1541
DO 1270 L=1,NSTA	1542
IF(L.EQ.K.OR.RA(I,K,L).LE.-4.) GO TO 1270	1543
IF(NLOG(I,L).LE.NLOG(I,K)) GO TO 1270	1544
TMPA=NCAB(I,K,L)	1545
TMPB=NLOG(I,L)	1546
TP=TMPA/(1.-(TMPB-TMPA)*RA(I,K,L)**2/TMPB)	1547
IF(TP.LE.TEMP) GO TO 1270	1548
LX=L	1549
TEMP=TP	1550
TMPB=THPA	1551
1270 CONTINUE	1552
IF(LX.LE.0) GO TO 1280	
IF(SQA(I,K,LX).LE..0001.OR.SQB(I,K,LX).LE..0001) GO TO 1280	
INDC=1	1553
TMP=SQA(I,K,LX)/SQB(I,K,LX)	1554
THPA=SUMA(I,K,LX)/TMPB	1555

	YMPB=SUMB(I,K,LX)/TMPB	1556
	AV(I,K)=TMPA+(AV(I,LX)-TMPB)*RA(I,K,LX)*TMP	1557
	SD(I,K)=SQA(I,K,LX)+(SD(I,LX)-SDB(I,K,LX))*RA(I,K,LX)**2*TMP	1558
1280	CONTINUE	1559
C	ADJUST STANDARD DEVIATIONS FOR CONSISTENCY	1560
	IF(NCSTY.LE.0) GO TO 1340	1561
C	TRANSFER FROM 1011	1562
1290	DO 1330 LX=1,NCSTY	1563
	K=ISTX(LX)	1564
	L=ISTY(LX)	1565
	DO 1320 I=1,12	1566
	TEMP=(AV(I,K)-AV(I,L))/3.	1567
	IF(AV(I,K).GT.AV(I,L)) GO TO 1300	1568
	TEMP=TEMP+SD(I,K)	1569
	IF(SD(I,L).LT.TEMP) GO TO 1310	1570
	TEMP=SD(I,K)*2.-TEMP	1571
	IF(SD(I,L) - TEMP) 1320,1320,1310	1572
1300	TEMP=TEMP+SD(I,K)	1573
	IF(SD(I,L).GT.TEMP) GO TO 1310	1574
	TEMP=SD(I,K)*2. - TEMP	1575
	IF(SD(I,L).GE.TEMP) GO TO 1320	1576
1310	SD(I,L)=TEMP	1577
1320	CONTINUE	1578
1330	CONTINUE	1579
	IF(ITRNS.GT.0) GO TO 2820	1580
1340	IF(INDC.LE.0.AND.NCSTY.LE.0) GO TO 1370	1581
	WRITE(6,1350)	1582
1350	FORMAT(/39H FREQUENCY STATISTICS AFTER ADJUSTMENTS )	1583
	WRITE(6,890)(MQ(I),I=1,12)	1584
	DO 1360 K=1,NSTA	1585
	WRITE(6,1010)ISTA(K),(AV(I,K),I=1,12)	1586
	WRITE(6,1020)(SD(I,K),I=1,12)	1587
	WRITE(6,1030)(SKEW(I,K),I=1,12)	1588
	WRITE(6,1040)(DD(I,K),I=1,12)	1589
1360	CONTINUE	1590
CG	***** TRANSFORM TO STANDARDIZED VARIATES *****	1591
1370	DO 1420 K=1,NSTA	1592
	M=1	1593
	DO 1410 J=1,NYRS	1594
	DO 1400 I=1,12	1595
	M=M+1	1596
	Q(M,K)=BLANK	1597
	IF(Q(M,K).EQ.T)GO TO 1400	1599
	IF(SD(I,K).EQ.0.)GO TO 1390	1600
	Q(M,K)=(Q(M,K)-AV(I,K))/SD(I,K)	1601
C	PEARSON TYPE III TRANSFORM	1602
	IF(SKEW(I,K).EQ.0.)GO TO 1400	1603
	TEMP=.5*SKEW(I,K)*Q(M,K)+1.	1604
	TMP=1.	1605
	IF(TEMP.GE.0.)GO TO 1380	1606
	TEMP=-TEMP	1607
	TMP=-1.	1608
1380	Q(M,K)=6.*(TMP*TEMP**(1./3.)-1.)/SKEW(I,K)+SKEW(I,K)/6.	1609
	GO TO 1400	1610
1390	Q(M,K)=0.	1611
1400	CONTINUE	1612
1410	CONTINUE	1613
1420	CONTINUE	1614
C	***** COMPUTE SUMS OF SQUARES AND CROSS PRODUCTS *****	1615
	DO 1450 K=1,NSTA	1616
	DO 1440 I=1,12	1617
	DO 1430 L=1,NSTAX	1618
	RA(I,K,L)=(-4.)	1619
	SUMA(I,K,L)=0.	1620
	SUMB(I,K,L)=0.	1621
	SQA(I,K,L)=0.	1622
	SDB(I,K,L)=0.	1623
	XPAB(I,K,L)=0.	1624
1430	NCA(I,K,L)=0	1625
	RA(I,K,K)=1.	1626
1440	CONTINUE	1627
1450	CONTINUE	1628

DN 1540 K=1,NSTA	1629
KX=K+1	1630
M=1	1631
DN 1480 J=1,NYRS	1632
DN 1470 I=1,12	1633
M=M+1	1634
TEMP=Q(M,K)	1635
IF(TEMP.EQ.T)GO TO 1470	1636
DN 1460 L=KX,NSTAX	1637
C SUBSCRIPTS EXCEEDING NSTA RELATE TO PRECEDING MONTH	1638
LX=L-NSTA	1639
IF(LX.LT.1) TMP=Q(M,L)	1640
IF(LX.GT.0) TMP=Q(M-1,LX)	1641
IF(TMP.EQ.T)GO TO 1460	1642
C COUNT AND USE ONLY RECORDED PAIRS	1643
NCAR(I,K,L)=NCAR(I,K,L)+1	1644
SUMA(I,K,L)=SUMA(I,K,L)+TEMP	1645
SUMR(I,K,L)=SUMR(I,K,L)+TMP	1646
SQA(I,K,L)=SQA(I,K,L)+TEMP*TEMP	1647
SOB(I,K,L)=SOB(I,K,L)+TMP*TMP	1648
XPAB(I,K,L)=XPAB(I,K,L)+TEMP*TMP	1649
IF(L.GT.NSTA) GO TO 1460	1650
NCAR(I,L,K)=NCAR(I,K,L)	1651
SUMA(I,L,K)=SUMA(I,K,L)	1652
SUMR(I,L,K)=SUMR(I,K,L)	1653
SQA(I,L,K)=SQA(I,K,L)	1654
SOB(I,L,K)=SOB(I,K,L)	1655
XPAB(I,L,K)=XPAB(I,K,L)	1656
1460 CONTINUE	1657
1470 CONTINUE	1658
1480 CONTINUE	1659
C * * * * * COMPUTE CORRELATION COEFFICIENTS * * * * *	1660
DN 1530 I=1,12	1661
DN 1520 L=KX,NSTAX	1662
LX=L-NSTA	1663
C ELIMINATE PAIRS WITH LESS THAN 3 YRS DATA	1664
IF(NCAR(I,K,L).LE.2) GO TO 1510	1665
TEMP=NCAR(I,K,L)	1666
TMP=(SQA(I,K,L)-SUMA(I,K,L)*SUMA(I,K,L)/TEMP)*(SOB(I,K,L)-SUMR	1667
1(I,K,L)*SUMR(I,K,L)/TEMP)	1668
C ELIMINATE PAIRS WITH ZERO VARIANCE PRODUCT	1669
IF(TMP.LE.0.) GO TO 1500	1670
TMPB=1.	1671
TMPA=XPAB(I,K,L)-SUMA(I,K,L)*SUMR(I,K,L)/TEMP	1672
C RETAIN ALGEBRAIC SIGN	1673
IF(TMPA.LT.0.)TMPB=-TMPB	1674
TMPA=TMPA*TMPB/TMP	1675
RA(I,K,L)=TMPB*TMPA**0.5	1676
ITP=I	1677
LA=L	1678
IF(L.LE.NSTA) GO TO 1490	1679
ITP=I-1	1680
IF(ITP.LT.1) ITP=12	1681
LA=LX	1682
1490 IF(SD(I,K).LT..0001.OR.SD(ITP,LA).LT..0001) RA(I,K,L)=0.	1683
GO TO 1510	1684
1500 RA(I,K,L)=0.	1685
1510 IF(L.GT.NSTA) GO TO 1520	1686
RA(I,L,K)=RA(I,K,L)	1687
1520 CONTINUE	1688
1530 CONTINUE	1689
1540 CONTINUE	1690
GO TO 2170	1691
1550 WRITE(6,1560)	1692
1560 FORMAT(/18H DATA OUT OF ORDER)	1693
GO TO 150	1694
CH * * * * * READ CORRELATION COEFFICIENTS * * * * *	1695
1570 DN 1630 K=1,NSTA	1696
IF (K.EQ.1)GO TO 1600	1697
ITP=K-1	1698
DN 1590 L=1,ITP	1699
C CURRENT MONTH CORRELATION	1700

C	READ(5,70)ITMP,ITEMP,(RA(I,K,L),I=1,12)	** CARD L **	1701
	RAV(K,L)=RA(1,K,L)		1702
	IF(IGNRL.EQ.1)ISTA(K)=ITMP		1703
	IF(ITMP.NE.ISTA(K))GO TO 1550		1704
	IF(ITEMP.NE.ISTA(L))GO TO 1550		1705
	DO 1540 I=1,12		1706
1580	RA(I,L,K)=RA(I,K,L)		1707
1590	CONTINUE		1708
	PRECEDING MONTH CORRELATION		1709
C			1710
1600	LX=NSTAA		1711
	IF(IGNRL.EQ.1) LX=NSTA+K		1712
	LA=NSTAX		1713
	IF(IGNRL.EQ.1) LA=LX		1714
	DO 1610 L=LX,LA		1715
	ITP=L-NSTA		1716
		** CARD K OR M **	1717
C	READ(5,70)ITMP,ITEMP,(RA(I,K,L),I=1,12)		1718
	IF(K.EQ.1)ISTA(K)=ITMP		1719
	IF(K.EQ.1)ISTA(ITP)=ITEMP		1720
	IF(IGNRL.EQ.1) RAV(K,K)=RA(1,K,L)		1721
	IF(ITMP.NE.ISTA(K))GO TO 1550		1722
	IF(ITEMP.NE.ISTA(ITP))GO TO 1550		1723
1610	CONTINUE		1724
	DO 1620 I=1,12		1725
1620	RA(I,K,K)=1.		1726
1630	CONTINUE		1727
C	* * * * * READ FREQUENCY STATISTICS * * * * *		1728
	DO 1640 K=1,NSTA		1729
		** CARD N CP D **	1730
C	READ(5,80)ITP,(AV(I,K),I=1,12)		1731
	IF(ITP.NE.ISTA(K))GO TO 1550		1732
C	GENERALIZED STATISTICS ON ONE CARD PER STATION		1733
	AVMY(K)=AV(1,K)		1734
	AVMN(K)=AV(2,K)		1735
	SDAV(K)=AV(3,K)		1736
	ITMP=AV(4,K)+.1		1737 *
	IMX(K)=ITMP-HQ(12)		1738 *
	ITMP=AV(5,K)+.1		1738-2 *
	IMN(K)=ITMP-HQ(12)		1739 *
	IF (IMX(K).LT.1) IMX(K)=IMX(K)+12		1740
	IF (IMN(K).LT.1) IMN(K)=IMN(K)+12		1741
	IF(IGNRL.EQ.1)GO TO 1640		1742
		** CARD P **	1743
C	READ(5,80)ITP,(SD(I,K),I=1,12)		1744
	IF(ITP.NE.ISTA(K))GO TO 1550		1745
		** CARD Q **	1746
C	READ(5,80)ITP,(SKEW(I,K),I=1,12)		1747
	IF(ITP.NE.ISTA(K))GO TO 1550		1748
		** CARD R **	1749
C	READ(5,90)ITP,(DO(I,K),I=1,12)		1750
	IF(ITP.NE.ISTA(K))GO TO 1550		1751
1640	CONTINUE		1752
CI	* * * * * ESTIMATE MISSING CORRELATION COEFFICIENTS * * * * *		1753
1650	IF(IGNRL.EQ.1)GO TO 3020		1754
	IF(NSTA.LE.1)GO TO 2310		1755
	DO 1720 I=1,12		1756
	IP=I-1		1757
	IF(IP.LT.1)IP=12		1758
	DO 1710 K=1,NSTA		1759
	ITP=K+1		1760
	DO 1700 L=ITP,NSTAX		1761
	L AND K CORRELATION POSSIBLY MISSING		1762
C	IF(RA(I,K,L).GE.(-1.)) GO TO 1700		1763
	RMAX=1.		1764
	RMIN=-1.		1765
	LX SEARCHES ALL RELATED CORRELATIONS EXCEPT FOLLOWING MTH		1766
C	DO 1690 LX=1,NSTAX		1767
	IF(LX.EQ.K)GO TO 1690		1768
	IF(L.EQ.LX)GO TO 1690		1769
	TEMP=RA(I,K,LX)		1770
	IF(L.LE.NSTA)GO TO 1660		1771

	IF(LX.LE.NSTA)GO TO 1670	1772
C	BOTH L AND LX REPRESENT PRECEDING MONTH	1773
	ITMP=L-NSTA	1774
	ITEMP=LX-NSTA	1775
	TMP=RA(IP,ITMP,ITEMP)	1776
	GO TO 1680	1777
C	L REPRESENTS CURRENT MONTH	1778
1660	TMP=RA(I,L,LX)	1779
	GO TO 1680	1780
C	LX AND NOT L REPRESENTS CURRENT MONTH	1781
1670	TMP=RA(I,LX,L)	1782
1680	IF (TMP+TEMP.LT.-2.0) GO TO 1690	1783
	TMPA=((1.-TEMP*TEMP)*(1.-TMP+TMP))	1784
	IF(TMPA.LT.0.)TMPA=0.	1785
	TMPA=TMPA**.5	1786
	TMPB=TMP*TEMP+TMPA	1787
	IF(TMPB.LT.RHAX)RHAX=TMPB	1788
	TMPB=TMPB-TMPA-TMPA	1789
	IF(TMPB.GT.RMIN)RMIN=TMPB	1790
1690	CONTINUE	1791
C	AVERAGE SMALLEST MAX AND LARGEST MIN CONSISTENT VALUE	1792
	RA(I,K,L)=(RHAX+RMIN)**.5	1793
	IF(L.LE.NSTA)RA(I,L,K)=RA(I,K,L)	1794
1700	CONTINUE	1795
1710	CONTINUE	1796
1720	CONTINUE	1797
	GO TO 2310	1798
CJ	***** TEST FOR TRIAD CONSISTENCY *****	1799
1730	NCA=0	1800
1740	FAC=1.	1801
	NCA=NCA+1	1802
	IF(NCA.LT.NSTA*12) GO TO 1750	1803
	WRITE(6,1840)	1804
	GO TO 150	1805
1750	NCB=0	1806
	NC=0	1807
1760	INDC=0	1808
	DO 1830 I=1,12	1809
	IP=I-1	1810
	IF(IP.LT.1)IP=12	1811
C	K, L, AND LX SEARCH ALL RELATED TRIOS OF CORREL CCEFS	1812
	DO 1820 K=1,NSTA	1813
	ITMP=K+1	1814
	DO 1810 L=ITMP,NSTAX	1815
	IF(L.EQ.NSTAX)GO TO 1810	1816
	LA=L-NSTA	1817
	R1=RA(I,K,L)	1818
	ITP=L+1	1819
	DO 1800 LX=ITP,NSTAX	1820
	ITEMP=LX-NSTA	1821
	R2=RA(I,K,LX)	1822
	IF(L.LE.NSTA)R3=RA(I,L,LX)	1823
C	BOTH L AND LX REPRESENT PRECEDING MONTH	1824
	IF(L.GT.NSTA)R3=RA(IP,LA,ITEMP)	1825
C	RAISE LOWEST COEFFICIENT IF INCONSISTENT	1826
	AC1=(1.-R1*R1)**.5	1827
	AC2=(1.-R2*R2)**.5	1828
	AC3=(1.-R3*R3)**.5	1829
	IF(R1.GT.R2) GO TO 1770	1830
	IF(R1.GT.R3) GO TO 1780	1831
	RMIN=R2*R3-AC2*AC3*FAC	1832
	IF(RMIN.LT.-1.) RMIN=-1.	1833
	IF(R1.GE.RMIN) GO TO 1800	1834
	INDC=1	1835
	RA(I,K,L)=RMIN	1836
	IF (L.LE.NSTA) RA(I,L,K)=RMIN	1837
	GO TO 1800	1838
1770	IF(R2.GT.R3) GO TO 1780	1839
	RMIN=R1*R3-AC1*AC3*FAC	1840
	IF(RMIN.LT.-1.) RMIN=-1.	1841
	IF(R2.GE.RMIN) GO TO 1800	1842
	INDC=1	1843



RA(I,K,LX)=RMIN	1844
IF (LX.LE.NSTA) RA(I,LX,K)=RMIN	1845
GO TO 1800	1846
1780 RMIN=R1+R2-AC1*AC2*FAC	1847
IF (RMIN.LT.-1.) RMIN=-1.	1848
IF (R3.GE.RMIN) GO TO 1800	1849
INDC=1	1850
IF (L.GT.NSTA) GO TO 1790	1851
RA(I,L,LX)=RMIN	1852
IF (LX.LE.NSTA) RA(I,LX,L)=RMIN	1853
GO TO 1800	1854
1790 RA(IP,LA,ITEMP)=RMIN	1855
RA(IP,ITEMP,LA)=RMIN	1856
1800 CONTINUE	1857
1810 CONTINUE	1858
1820 CONTINUE	1859
1830 CONTINUE	1860
NC=NC+1	1861
IF (NC.LE.NSTA*12) GO TO 1850	1862
WRITE(6,1840)	1863
1840 FORMAT(32H CORRELATION MATRIX INCONSISTENT)	1864
GO TO 150	1865
1850 IF (INDC.EQ.1) GO TO 1760	1866
CK * * * * * TEST FOR OVER-ALL CONSISTENCY * * * * *	1867
ITEMP=0	1868
GO TO 1870	1869
1860 ITEM=1	1870
C WHEN ITEM=1, CURRENT MONTH USED FOR ALL INDEPENDENT STAS	1871
C OTHERWISE, PREC MTH USED FOR CURRENT AND SUBSEQUENT STAS	1872
1870 NINDP=NSTA	1873
NVAR=NINDP+1	1874
DO 2150 I=1,12	1875
IP=I+1	1876
IF (IP.LT.1) IP=12	1877
C CONSTRUCT COMPLETE CORREL MATRIX FOR EACH MONTH AND STA	1878
DO 2150 K=1,NSTA	1879
C L IS ROW NUMBER, J IS COLUMN NUMBER	1880
DO 2020 L=1,NSTA	1881
LX=L+NSTA	1882
DO 1980 J=1,NSTA	1883
JX=J+NSTA	1884
IF (L=K) 1880,1920,1960	1885
1880 IF (J=K) 1890,1910,1900	1886
1890 R(L,J) = DBLE(RA(I,L,J))	1887000
LTMP(L)=L	1888
JTMP(J)=J	1889
GO TO 1970	1890
1900 IF (ITEMP) 1910,1910,1890	1891
1910 R(L,J) = DBLE(RA(I,L,JX))	1892000
LTMP(L)=L	1893
JTMP(J)=JX	1894
GO TO 1970	1895
1920 IF (J=K) 1930,1940,1950	1896
1930 R(L,J) = DBLE(RA(I,J,LX))	1897000
LTMP(L)=J	1898
JTMP(J)=LX	1899
GO TO 1970	1900
1940 R(L,J) = DBLE(RA(IP,L,J))	1901000
LTMP(L)=LX	1902
JTMP(J)=JX	1903
GO TO 1970	1904
1950 IF (ITEMP) 1940,1940,1930	1905
1960 IF (ITEMP) 1920,1920,1880	1906
1970 R(J,L)=R(L,J)	1907
1980 CONTINUE	1908
LTMP(L)=K	1909
C SPECIAL SUBSCRIPT FOR DEPENDENT VARIABLE	1910
IF (L=K) 1990,2010,2000	1911
1990 R(L,NSTAA) = DBLE(RA(I,K,L))	1912000
JTMP(NSTAA)=L	1913
GO TO 2020	1914
2000 IF (ITEMP.GT.0) GO TO 1990	1915

2010 R(L,NSTAA) = DBLE(RA(I,K,LX))	1916000
JTHP(NSTAA)=LX	1917
2020 CONTINUE	1918
C MATRIX CONSISTENT IF CORREL DOES NOT EXCEED 1.0	1919
N=0	1920
NC=0	1921
C =====	1922
2030 CALL CROUT(R)	1923
C =====	1924
IF(DTRNC.LE.1.) GO TO 2130	1925
WRITE(6,2040) N,I,K,DTRNC	1926
2040 FORMAT (/36H INCONSISTENT CORREL MATRIX ADJUSTED,3I4,F12.3)	1927000
C	1928-1931
FAC=FAC-.2	1932
IF(FAC.GT.-.1)GO TO 1750	1933
NC=1	1934
N=N+1	1935
IF(N.GT.10) GO TO 150	1936
SUM=0.	1937
DO 2050 L=1,NINDP	1938
DO 2070 LX=1,NVAR	1939
IF(L.EQ.LX) GO TO 2070	1940
THPP=R(L,LX)	1941
SUM=SUM+THPP	1942
2070 CONTINUE	1943
2080 CONTINUE	1944
TEMP=NINDP*NINDP	1945
SUM=SUM/TEMP	1946
TEMP=DTRNC-1.	1947
IF(TEMP.GT..1) TEMP=.1	1948
TMP=1.-TEMP	1949
DO 2120 L=1,NINDP	1950
ITP=L+1	1951
DO 2110 LX=ITP,NVAR	1952
R(L,LX) = DBLE(THPP*TMP + SUM*TEMP)	1953000
IF(LX.LE.NINDP) R(LX,L)=R(L,LX)	1954
LTP=LTP(L)	1955
JTP=JTHP(LX)	1956
IF(LTP.LE.NSTA) GO TO 2100	1957
IF(ITP.LE.NSTA) GO TO 2090	1958
LTP=LTP-NSTA	1959
JTP=JTP-NSTA	1960
RA(IP,LTP,JTP)=R(L,LX)	1961
RA(IP,JTP,LTP)=R(L,LX)	1962
GO TO 2110	1963
2090 ITHP=LTP	1964
LTP=JTP	1965
JTP=ITHP	1966
2100 RA(I,LTP,JTP)=R(L,LX)	1967
IF(ITP.LE.NSTA) RA(I,JTP,LTP)=R(L,LX)	1968
2110 CONTINUE	1969
2120 CONTINUE	1970
GO TO 2030	1971
2130 IF(DTRNC.GE.0.) GO TO 2140	1972
WRITE(6,70)I,K,DTRNC	1973
DTRNC=0.	1974
2140 IF(NC.GT.0) GO TO 1740	1975
2150 CONTINUE	1976
2160 CONTINUE	1977
IF (ITEMP.EQ.0) GO TO 1860	1978
IF(ITRNS.EQ.2) GO TO 3100	1979
2170 WRITE(6,10)	1980
C * * * * * PRINT CORRELATION MATRIX * * * * *	1981
DO 2260 I=1,12	1982
IF(ITRNS.LE.0) WRITE(6,2180)MO(I)	1983
2180 FORMAT (/39H RAW CORRELATION COEFFICIENTS FOR MONTH,I3)	1984000
IF(ITRNS.GT.0) WRITE(6,2190) MO(I)	1985
2190 FORMAT (/40H CONSISTENT CORRELATION MATRIX FOR MONTH,I3)	1986000
WRITE(6,2200)(ISTA(K),K=1,NSTA)	1987
2200 FORMAT (/3X,3HSTA,18I7)	1988000
WRITE(6,2210)	1989
2210 FORMAT(20X,19H WITH CURRENT MONTH)	1990

DO 2220 K=1,NSTA	1991
2220 WRITE(6,2230) ISTA(K), (RA(I,K,L),L=1,NSTA)	1992
2230 FORMAT (1X,15,10F7.3)	1993000
WRITE(6,2240)	1994
2240 FORMAT (20X,36H WITH PRECEDING MONTH AT ABOVE STATION)	1995000
ITP=NSTA+1	1996
DO 2250 K=1,NSTA	1997
2250 WRITE(6,2230) ISTA(K), (RA(I,K,L),L=ITP,NSTAX)	1998
2260 CONTINUE	1999
IF (IANAL.LE.0) GO TO 3100	2000
IF (ITRNS.LE.0) GO TO 1650	2001
IF (IPCHS.LE.0) GO TO 2670	2002
PUNCH ESSENTIAL ELEMENTS OF MATRIX	2003
DO 2300 K=1,NSTA	2004
IF (K.EQ.1) GO TO 2280	2005
ITP=K-1	2006
DO 2270 L=1,ITP	2007
2270 WRITE(7,70) ISTA(K), ISTA(L), (RA(I,K,L),I=1,12)	2008
2280 DO 2290 L=NSTAA,NSTAX	2009
ITEMP=L-NSTA	2010
2290 WRITE(7,70) ISTA(K), ISTA(ITEMP), (RA(I,K,L),I=1,12)	2011
2300 CONTINUE	2012
GO TO 2850	2013
CL * * * * * RECONSTITUTE MISSING DATA * * * * * * * * * * * * * * *	2014
2310 IF (IANAL.LE.0) GO TO 3100	2015
IF (IRCON.LE.0) GO TO 2610	2016
NVAR=NSTA+1	2017
M=1	2018
DO 2600 J=1,NYRS	2019
DO 2590 I=1,12	2020
IX=I-1	2021
IF (IX.LT.1) IX=12	2022
M=M+1	2023
DO 2580 K=1,NSTA	2024
IF (Q(M,K).NE.T) GO TO 2580	2025
FORM CORRELATION MATRIX FOR EACH MISSING FLOW	2026
NINDP=0	2027
DO 2390 L=1,NSTA	2028
LX=L-NSTA	2029
IF (Q(M,L).NE.T) GO TO 2320	2030
IF (Q(M-1,L).EQ.T) GO TO 2390	2031
NINDP=NINDP+1	2032
ITEMP=NINDP	2033
X(NINDP)=Q(M-1,L)	2034
R(NINDP,NVAR) = DBLE(RA(I,X,LX))	2035000
GO TO 2330	2036
2320 NINDP=NINDP+1	2037
ITEMP=NINDP	2038
X(NINDP)=Q(M,L)	2039
R(NINDP,NVAR) = DBLE(RA(I,K,LX))	2040000
2330 R(NINDP,NINDP) = 1.000	2041000
IF (L.EQ.NSTA) GO TO 2390	2042
ITP=L+1	2043
DO 2380 LA=ITP,NSTA	2044
JX=LA-NSTA	2045
IF (Q(M,L).EQ.T) GO TO 2350	2046
IF (Q(M,LA).EQ.T) GO TO 2340	2047
ITEMP=ITEMP+1	2048
R(NINDP,ITEMP) = DBLE(RA(I,L,LA))	2049000
GO TO 2370	2050
2340 IF (Q(M-1,LA).EQ.T) GO TO 2380	2051
ITEMP=ITEMP+1	2052
R(NINDP,ITEMP) = DBLE(RA(I,L,JX))	2053000
GO TO 2370	2054
2350 IF (Q(M,LA).EQ.T) GO TO 2360	2055
ITEMP=ITEMP+1	2056
R(NINDP,ITEMP) = DBLE(RA(I,LA,LX))	2057000
GO TO 2370	2058
2360 IF (Q(M-1,LA).EQ.T) GO TO 2380	2059
ITEMP=ITEMP+1	2060
R(NINDP,ITEMP) = DBLE(RA(IX,L,LA))	2061000
ADD SYMMETRICAL ELEMENTS	2062

2370	R(ITEMP,NINDP)=R(NINDP,ITEMP)	2063
2380	CONTINUE	2064
2390	CONTINUE	2065
	IF(NINDP.GT.0) GO TO 2400	2066
	NINDP=1	2067
	X(1)=0.	2068
	P(1,1) = 1.000	2069000
	LX=K+NSTA	2070
	R(1,NVAR) = DBLE(RA(I,K,LX))	2071000
2400	ITEMP=NINDP+1	2072
	DO 2410 L=1,NINDP	2073
2410	R(L,ITEMP)=R(L,NVAR)	2074
C	=====	2075
2420	CALL CROUT (R)	2076
C	=====	2077
	ITEMP=NINDP+1	2078
	TEMP=1.	2079
	INDC=0	2080
	DO 2440 L=1,NINDP	2081
	TMP=OAB3(R(L,ITEMP))	2082
	IF(TMP.GT.TEMP) GO TO 2430	2083
	TEMP=TMP	2084
	ITP=L	2085
2430	IF(R(L,ITEMP).LE.0..AND.B(L).GT.(-1.5).AND.B(L).LT.0.5) GO TO 2440	2086
	IF(R(L,ITEMP).GE.0..AND.B(L).GT.(-0.5).AND.B(L).LT.1.5) GO TO 2440	2087
	INDC=1	2088
2440	CONTINUE	2089
	IF(INDC.GT.0) GO TO 2450	2090
	IF(DTRMC.LE.1..AND.DTRMC.GE.0.) GO TO 2510	2091
C	IF MATRIX INCONSISTENT, OMIT VARIABLE WITH LEAST	2092
C	CORRELATION	2093
2450	ITMP=NINDP-1	2094
	IF(ITP.GT.ITMP) GO TO 2480	2095
	DO 2470 L=ITP,ITMP	2096
	DO 2460 LA=1,ITEMP	2097
2460	R(L,LA)=R(L+1,LA)	2098
2470	X(L)=X(L+1)	2099
2480	DO 2500 L=1,ITMP	2100
	DO 2490 LA=ITP,NINDP	2101
2490	R(L,LA)=R(L,LA+1)	2102
2500	CONTINUE	2103
	NINDP=ITMP	2104
	GO TO 2420	2105
C	ADD RANDOM COMPONENT TO PRESERVE VARIANCE	2106
2510	TEMP=0.	2107
	DO 2520 L=1,6	2108
	TEMP=TEMP+RNGEN(IXX)	2109
2520	TEMP=TEMP-RNGEN(IXX)	2110
C	COMPUTE FLOW	2111
	AL=(1.-DTRMC)**.5	2112
	TEMP=TEMP*AL	2113
	DO 2530 L=1,NINDP	2114
2530	TEMP=TEMP+B(L)*X(L)	2115
	Q(M,K)=TEMP	2116
	QP(M,K)=E	2117
	TP=Q(M,K)	2118
C	ADD NEW VALUE TO SUMS OF SQUARES AND CROSS PRODUCTS	2119
	DO 2560 L=1,NSTAX	2120
	IF(L.EQ.K) GO TO 2560	2121
C	SUBSCRIPTS EXCEEDING NSTA RELATE TO PRECEDING MONTH	2122
	LX=L-NSTA	2123
	IF(LX.LT.1) TMP=Q(M,L)	2124
	IF(LX.GT.0) TMP=Q(M-1,LX)	2125
	IF (TMP.EQ.T) GO TO 2560	2126
C	COUNT AND USE ONLY RECORDED PAIRS	2127
	NCAB(I,K,L)=NCAB(I,K,L)+1	2128
	SUMA(I,K,L)=SUMA(I,K,L)+TP	2129
	SUMB(I,K,L)=SUMB(I,K,L)+TMP	2130
	SQA (I,K,L)=SQA (I,K,L)+TP*TP	2131
	SQB (I,K,L)=SQB (I,K,L)+TMP*TMP	2132
	XPAR(I,K,L)=XPAR(I,K,L)+TP*TMP	2133
	IF(L.GT.NSTA) GO TO 2540	2134

NCAB(I,L,K)=NCAB(I,K,L)	2135
SUMA(I,L,K)=SUMB(I,K,L)	2136
SUMB(I,L,K)=SUMA(I,K,L)	2137
SOA(I,L,K)=SOB(I,K,L)	2138
SQB(I,L,K)=SOA(I,K,L)	2139
XPAB(I,L,K)=XPAB(I,K,L)	2140
C RECHNPUTE CORRELATION COEFFICIENTS TO INCLUDE NEW DATA	2141
2540 IF(NCAB(I,K,L).LE.2) GO TO 2560	2142
TEMP=NCAB(I,K,L)	2143
TMP=(SOA(I,K,L)-SUMA(I,K,L)*SUMA(I,K,L)/TEMP)*(SOB(I,K,L)-SUMB	2144
1(I,K,L)*SUMB(I,K,L)/TEMP)	2145
C ELIMINATE PAIRS WITH ZERO VARIANCE PRODUCT	2146
IF(TMP.LE.0.) GO TO 2560	2147
TMPB=1.	2148
THPA=XPAB(I,K,L)-SUMA(I,K,L)*SUMB(I,K,L)/TEMP	2149
C RETAIN ALGEBRAIC SIGN	2150
IF(THPA.LT.0.)TMPB=-TMPB	2151
TMPA=THPA*TMPA/TMP	2152
RA(I,K,L)=TMPB*THPA**.5	2153
ITP=1	2154
LA=L	2155
IF(L.LE.NSTA) GO TO 2550	2156
ITP=I-1	2157
IF(ITP.LT.1) ITP=12	2158
LA=LX	2159
2550 IF(SD(I,K).LT..0001.OR.SD(ITP,LA).LT..0001) RA(I,K,L)=0.	2160
IF(L.GT.NSTA) GO TO 2560	2161
RA(I,L,K)=RA(I,K,L)	2162
2560 CONTINUE	2163
ITMP=NYSR*12+1	2164
IF(M.GE.ITMP) GO TO 2580	2165
TEMP=G(M,K)	2166
DO 2570 L=1,NSTA	2167
TMP=G(M+1,L)	2168
IF(TMP.EQ.T) GO TO 2570	2169
LX=K+NSTA	2170
ITP=I+1	2171
IF(ITP.GT.12) ITP=1	2172
NCAB(ITP,L,LX)=NCAB(ITP,L,LX)+1	2173
SUMA(ITP,L,LX)=SUMA(ITP,L,LX)+TMP	2174
SUMB(ITP,L,LX)=SUMB(ITP,L,LX)+TP	2175
SOA(ITP,L,LX)=SOA(ITP,L,LX)+TMP*TMP	2176
SQB(ITP,L,LX)=SOB(ITP,L,LX)+TP*TP	2177
XPAB(ITP,L,LX)=XPAB(ITP,L,LX)+TP*TMP	2178
IF(NCAB(ITP,L,LX).LE.2) GO TO 2570	2179
TEMP=NCAB(ITP,L,LX)	2180
TMP=(SOA(ITP,L,LX)-SUMA(ITP,L,LX)*SUMA(ITP,L,LX)/TEMP)*	2181
1(SQB(ITP,L,LX)-SUMB(ITP,L,LX)*SUMB(ITP,L,LX)/TEMP)	2182
IF(TMP.LE.0.) GO TO 2570	2183
TMPB=1.	2184
THPA=XPAB(ITP,L,LX)-SUMA(ITP,L,LX)*SUMB(ITP,L,LX)/TEMP	2185
IF(THPA.LT.0.)TMPB=-TMPB	2186
TMPA=THPA*TMPA/TMP	2187
RA(ITP,L,LX)=TMPB*THPA**.5	2188
IF(SD(I,K).LT..0001.OR.SD(ITP,L).LT..0001) RA(ITP,L,LX)=0.	2189
2570 CONTINUE	2190
2580 CONTINUE	2191
2590 CONTINUE	2192
2600 CONTINUE	2193
2610 IF(TANAL.LE.0) GO TO 3100	2194
CM * * * * * CONVERT STANDARD DEVIATES TO FLOWS * * * * *	2195
IF(NPASS.LE.1) GO TO 2630	2196
ITMP=NYSR*12+1	2197
DO 2620 ITMP=1,100	2198
IF(LOTAP.EQ.NQTAP) GO TO 2630	2199
READ(IQTAP)	2200
2620 LOTAP=LOTAP+1	2201
2630 WRITE(6,10)	2202
WRITE(6,2640)	2203
2640 FORMAT(33H RECORDED AND RECONSTITUTED FLOWS)	2204
IF(NPASS.GT.1) WRITE(6,2650) IPASS	2205
2650 FORMAT(5H PASS,13)	2206

ANYRS=NYRS	2207
DO 2810 K=1,NSTA	2208
IF(K.GT.NSTX) WRITE(6,2660) (MQ(I),I=1,12)	2209
2660 FORMAT (/11H STA YEAR,12I6,6X,5HTOTAL)	2210000
M=1	2211
DO 2760 J=1,NYRS	2212
ITP=0	2213
DO 2720 I=1,12	2214
M=M+1	2215
TEMP=0(M,K)	2216
TMP=SKEW(I,K)	2217
IF(TMP.NE.0.) TEMP=((TMP*(TEMP-TMP/6.)/6.+1.)**3 -1.)*2./TMP	2218
IF(OR(M,K).NE.E) GO TO 2690	2219
IF(TEMP.GT.2..AND.SD(I,K).GT..3) TEMP=2.+(TEMP-2.)*.3/SD(I,K)	2220
IF(TMP.LT.-.0001.OR.TMP.GT..0001) TMP=(-2.)/TMP	
IF(SKEW(I,K)) 2670,2690,2680	2222
2670 IF(TEMP.GT.TMP) TEMP=TMP	2223
GO TO 2690	2224
2680 IF(TEMP.LT.TMP) TEMP=TMP	2225
2690 TMP=TEMP*SD(I,K)+AV(I,K)	2226
Q(M,K)=10.**TMP-00(I,K)	2227
IF(Q(M,K).LT.0..AND.QMIN(I,K).GE.0.) Q(M,K)=0.	2228
QM(I)=QR(M,K)	2229
ITMP=NSUM(K,IPASS)	
IF(ITMP.LE.0) GO TO 2710	
TEMP=0.	2232
DO 2700 L=1,ITMP	2233
LX=IST(K,L,IPASS)	
2700 TEMP=TEMP+Q(M,LX)	2235
IF(Q(M,K).GT.TEMP) GO TO 2710	2236
QM(I)=ADJ	2237
IF(OR(M,K).NE.E) GO TO 2710	2238
QM(I)=ADJ1	2239
Q(M,K)=TEMP	2240
2710 IQ(I)=Q(M,K)+.5	2241
2720 ITP=ITP+IQ(I)	2242
IYR=IYR+J	2243
IF(K.LE.NSTX) GO TO 2760	2244
IF(IPCHQ.LE.0) GO TO 2740	2245
WRITE(7,2730) ISTA(K),IYR,(IQ(I),I=1,12)	2246
2730 FORMAT(214,12I6)	2247
2740 WRITE(6,2750) ISTA(K),IYR,(IQ(I),QM(I),I=1,12) , ITP	2248
2750 FORMAT(1X,14,16,18,18,11(17,11),110)	2249
2760 CONTINUE	2250
IF(NPASS.LE.1) GO TO 2765	2250=1
WRITE(10TAP) ISTA(K), (Q(M,K),M=1,ITMP)	2251
NOTAP=NOTAP+1	2252
2765 IF(IRCON.LE.0) GO TO 2810	2253
CN * * * * RECOMPUTE MEAN AND STANDARD DEVIATION * * * * * * * * *	2254
DO 2770 I=1,12	2255
AV(I,K)=0.	2256
SKEW(I,K)=0.	2257
2770 SD(I,K)=0.	2258
M=1	2259
DO 2790 J=1,NYRS	2260
DO 2780 I=1,12	2261
M=M+1	2262
TEMP=ALOG(Q(M,K)+QM(I,K))*4342945	2263
AV(I,K)=AV(I,K)+TEMP	2264
SKEW(I,K)=SKEW(I,K)+TEMP**3	2265
2780 SD(I,K)=SD(I,K)+TEMP*TEMP	2266
2790 CONTINUE	2267
DO 2800 I=1,12	2268
TEMP=AV(I,K)	2269
TMPA=SD(I,K)	2270
TMP=(SD(I,K)-TEMP*TEMP/ANYRS)/(ANYRS-1.)	2271
IF(TMP.LT.0.) TMP=0.	2272
AV(I,K)=TEMP/ANYRS	2273
SD(I,K)=TMP**5	2274
TMP=SKEW(I,K)	2275
SKEW(I,K)=0.	2276
IF(SD(I,K).LE..0005) GO TO 2800	2277

	SKEW(I,K)=(ANYRS**2*TMP-3.*ANYRS*TEMP*TMPA+2.*TEMP**3)	2278
	1/(ANYRS*(ANYRS-1.)*(ANYRS-2.)*SD(I,K)**3)	2279
2800	CONTINUE	2280
2810	CONTINUE	2281
	LOTAP=NOTAP	2282
	ITRNS=1	2283
	IF(IPCON.LE.0) GO TO 2930	2284
	IF(NCSTY.GT.0) GO TO 1290	2285
C	PRINT ADJUSTED FREQUENCY STATISTICS	2286
2820	WRITE(6,10)	2287
	WRITE(6,2830)	2288
2830	FORMAT(/30H ADJUSTED FREQUENCY STATISTICS)	2289
	WRITE(6,890) (NO(I),I=1,12)	2290
	DO 2840 K=NSTXX,NSTA	2291
	WRITE(6,1010) ISTA(K),(AV(I,K),I=1,12)	2292
	WRITE(6,1020) (SD(I,K),I=1,12)	2293
	WRITE(6,1030) (SKEW(I,K),I=1,12)	2294
	WRITE(6,1040) (DG(I,K),I=1,12)	2295
2840	CONTINUE	2296
C	PRINT CONSISTENT CORRELATION MATRIX	2297
	ITRNS=1	2298
	GO TO 2170	2299
2850	IF(IPCHS.LE.0) GO TO 2870	2300
C	PUNCH FREQUENCY STATISTICS	2301
	DO 2860 K=NSTXX,NSTA	2302
	WRITE(7,80) ISTA(K),(AV(I,K),I=1,12)	2303
	WRITE(7,80) ISTA(K),(SD(I,K),I=1,12)	2304
	WRITE(7,80) ISTA(K),(SKEW(I,K),I=1,12)	2305
	WRITE(7,90) ISTA(K),(DG(I,K),I=1,12)	2306
2860	CONTINUE	2307
C	COMPUTE COMBINATION FLOWS	2308
C		2309
2870	IF(NCOMB.LE.0) GO TO 2910	2310
	ITMP=12*NYRS+1	2311
	DO 2900 M=2,ITMP	2312
	DO 2890 KX=1,NCOMB	2313
	K=KX+NSTA	2314
	ITP=NSTAC(KX,IPASS)	
	Q(M,K)=0.	2316
	DO 2880 L=1,ITP	2317
	ITEMP=KSTAC(KX,L,IPASS)	
2880	Q(M,K)=Q(M,K)+Q(M,ITEMP)*CSTAC(KX,L,IPASS)	2320
2890	CONTINUE	2321
2900	CONTINUE	2322
C		2323
CD	***** MAX AND MIN RECONSTITUTED FLOWS *****	2324
2910	N=0	2325
	ITRNS=1	2326
	IF(MXRCS.LE.0) GO TO 2930	2327
	ITMP=NYRS	2328
2920	IF(ITMP.LE.0) GO TO 2930	2329
	N=N+1	2330
	NJ=MXRCS	2331
	ITMP=ITMP-MXRCS	2332
	IF(ITMP.GE.0) GO TO 2930	2333
	ITMP=MXRCS+ITMP	2334
	NJ=ITMP	2335
	ITMP=0	2336
	GO TO 2930	2337
2930	IF(IGNRL.NE.2) GO TO 3020	2338
C	***** COMPUTE GENERALIZED STATISTICS *****	2339
	WRITE(6,130)	2340
	DO 3000 K=1,NSTA	2341
C	AVERAGE CORRELATION COEFFICIENT	2342
	DO 2950 L=1,K	2343
	LY=L+NSTA	2344
	RAV(K,L)=0.	2345
	DO 2940 I=1,12	2346
	TMP=RA(I,K,L)	2347
	IF(L.GE.K) TMP=RA(I,K,LX)	2348
2940	RAV(K,L)=RAV(K,L)+TMP	2349
	RAV(K,L)=RAV(K,L)/12.	

WRITE(6,70)ISTA(K),ISTA(L),RAV(K,L)	2350
2950 CONTINUE	2351
C AVERAGE LOGS FOR WET AND DRY SEASONS	2352
AVMX(K)=AV(11,K)+AV(12,K)+AV(1,K)	2353
IMX(K)=1	2354
AVMN(K)=AVMX(K)	2355
IMN(K)=1	2356
TMP=AV(12,K)+AV(1,K)+AV(2,K)	2357
IF(AVMX(K).GE.TMP)GO TO 2960	2358
AVMX(K)=TMP	2359
IMX(K)=2	2360
GO TO 2970	2361
2960 AVMN(K)=TMP	2362
IMN(K)=2	2363
C AND AVERAGE STANDARD DEVIATION	2364
2970 SDAV(K)=SD(1,K)+SD(2,K)	2365
DO 2990 I=3,12	2366
SDAV(K)=SDAV(K)+SD(I,K)	2367
TMP=AV(I-2,K)+AV(I-1,K)+AV(I,K)	2368
IF(AVMX(K).GE.TMP)GO TO 2980	2369
AVMX(K)=TMP	2370
IMX(K)=I	2371
2980 IF(AVMN(K).LE.TMP)GO TO 2990	2372
AVMN(K)=TMP	2373
IMN(K)=I	2374
2990 CONTINUE	2375
AVMX(K)=AVMX(K)/3.	2376
AVMN(K)=AVMN(K)/3.	2377
SDAV(K)=SDAV(K)/12.	2378
3000 CONTINUE	2379
WRITE(6,140)	2380
DO 3010 K=1,NSTA	2381
ITP=IMX(K)	2382
ITMP=IMN(K)	2383
3010 WRITE(6,120)ISTA(K),AVMX(K),AVMN(K),SDAV(K),HQ(ITP),HQ(ITMP)	2384
C * * * * * APPLY GENERALIZED STATISTICS * * * * *	2385
3020 IF(IGNRL.LE.0)GO TO 3100	2386
DO 3080 K=1,NSTA	2387
KX=K+NSTA	2388
C INTERMEDIATE MONTHS	2389
NMXMN=IMN(K)-IMX(K)-3	2390
IF(NMXMN.LT.0)NMXMN=NMXMN+12	2391
NMNMN=6-NMXMN	2392
DO 3040 I=1,12	2393
C STANDARD DEVIATION UNIFORM, SKEW ZERO	2394
SKEW(I,K)=0.	2395
DO(I,K)=0.	2396
SD(I,K)=SDAV(K)	2397
DO 3030 L=1,NSTA	2398
C ZERO CORRELATION WITH OTHER STATIONS AND PRECEDING MONTH	2399
LY=L+NSTA	2400
RA(I,K,LX)=0.	2401
IF(L.GE.K)GO TO 3030	2402
C UNIFORM SERIAL CORREL INTERMEDIATE MONTHS AND INTER-STA	2403
RA(I,K,L)=RAV(K,L)	2404
RA(I,L,K)=RA(I,K,L)	2405
3030 CONTINUE	2406
RA(I,K,KX)=RAV(K,K)	2407
RA(I,K,K)=1.	2408
3040 CONTINUE	2409
C MEAN AND SERIAL CORREL, WET AND DRY SEASONS	2410
TMP=RAV(K,K)+.15	2411
TEMP=TMP-.3	2412
IF(TMP.GT..98)TMP=.98	2413
IF(TEMP.LT.0)TEMP=0.	2414
ITP=IMX(K)	2415
AV(ITP,K)=AVMX(K)-.1	2416
RA(ITP,K,KX)=TEMP	2417
ITP=IMX(K)-1	2418
IF(ITP.LT.1)ITP=12	2419
AV(ITP,K)=AVMX(K)+.2	2420
RA(ITP,K,KX)=TEMP	2421



ITP=IMX(K)-2	2422
IF(ITP.LT.1) ITP=ITP+12	2423
AV(ITP,K)=AVMX(K)*.1	2424
RA(ITP,K,KX)=TEMP	2425
ITP=IMN(K)	2426
AV(ITP,K)=AVMN(K)	2427
RA(ITP,K,KX)=TMP	2428
ITP=IMN(K)-1	2429
IF(ITP.LT.1) ITP=12	2430
AV(ITP,K)=AVMN(K)	2431
RA(ITP,K,KX)=TMP	2432
ITP=IMN(K)-2	2433
IF(ITP.LT.1) ITP=ITP+12	2434
AV(ITP,K)=AVMN(K)	2435
RA(ITP,K,KX)=TMP	2436
C MEANS FOR MONTHS FOLLOWING WET SEASON	2437
IF(NMXMN.LT.1) GO TO 3060	2438
ITP=IMX(K)	2439
TEMP=NMXMN+1	2440
TEMP=(AVMX(K)*.1-AVMN(K))/TEMP	2441
DO 3050 IX=1,NMXMN	2442
TMP=IX	2443
I=IMX(K)+IX	2444
IF(I.GT.12) I=I-12	2445
3050 AV(I,K)=AV(ITP,K)-TEMP*TMP	2446
C MEANS FOR MONTHS FOLLOWING DRY SEASON	2447
3060 IF(NMNMN.LT.1) GO TO 3090	2448
ITP=IMN(K)	2449
TEMP=NMNMN+1	2450
TEMP=(AVMX(K)*.1-AVMN(K))/TEMP	2451
DO 3070 IX=1,NMNMN	2452
TMP=IX	2453
I=IMN(K)+IX	2454
IF(I.GT.12) I=I-12	2455
3070 AV(I,K)=AV(ITP,K)+TEMP*TMP	2456
3080 CONTINUE	2457
3090 IGRNL=0	2458
IRCON=0	2459
GO TO 1730	2460
3100 IF(NYRG.LE.0.AND.NPROJ.LE.0.AND.NPA39.LE.1) GO TO 150	2461 *
CP * * * * * FLOW GENERATION EQUATIONS * * * * *	2462
NINDP=NSTA	2463
NVAR=NSTA+1	2464
DO 3200 I=1,12	2465
IP=I-1	2466
IF (IP.LT.1) IP=12	2467
DO 3190 K=1,NSTA	2468
DO 3140 L=1,NSTA	2469
C CORRELATIONS IN CURRENT MONTH	2470
IF (L.GE.K) GO TO 3120	2471
R(L,NVAR) = DBLE(RA(I,K,L))	2472000
DO 3110 LA=L,NSTA	2473
LX=LA+NSTA	2474
IF (LA.LT.K) R(L,LA) = DBLE(RA(I,L,LA))	2475000
IF (LA.GE.K) R(L,LA) = DBLE(RA(I,L,LX))	2476000
3110 R(LA,L)=R(L,LA)	2477
GO TO 3140	2478
C CORRELATIONS WITH PRECEDING MONTH	2479
3120 LX=L+NSTA	2480
R(L,NVAR) = DBLE(RA(I,K,LX))	2481000
DO 3130 LA=L,NSTA	2482
R(L,LA) = DBLE(RA(IP,L,LA))	2483000
3130 R(LA,L)=R(L,LA)	2484
3140 CONTINUE	2485
C =====	2486
CALL CROUT(R)	2487
C =====	2488
DO 3150 L=1,NSTA	2489
3150 BETA(I,K,L)=B(L)	2490
IF(DTRMC.LE.1.) GO TO 3170	2491
WRITE(6,3160) I,K,DTRMC	2492
3160 FORMAT (34H INCONSISTENT CORREL MATRIX FOR I=,I3,4H K=,I2,	2493000

13H DTRMS=F6.3)	2494000
ITRMS=2	2495
GO TO 1730	2496
3170 IF(DTRHC.GE.0.) GO TO 3180	2497
WRITE(6,70)I,K,DTRHC	2498
DTRHC=0.	2499
3180 ALCFIT(I,K)=(1.-DTRHC)**.5	2500
3190 CONTINUE	2501
3200 CONTINUE	2502
C * * * * * GENERATE FLOWS * * * * *	2503
IF(NPASS.LE.1) GO TO 3240	2504
3210 IF(LSTAT.EQ.NSTAT) GO TO 3220	2505
READ (ISTAT)	2506
LSTAT=LSTAT+1	2507
GO TO 3210	2508
3220 WRITE(ISTAT)NSTYX,NSTA,(ISTA(K),K=1,NSTA)	2509
NSTAT=NSTAT+1	2510
LSTAT=NSTAT	2511
DO 3230 K=1,NSTA	2512
WRITE(ISTAT) ISTA(K),(AV(I,K),SD(I,K),SKEW(I,K),DR(I,K),	2513
1 (BETA(I,K,L),L=1,NSTA),ALCFIT(I,K),I=1,12)	2514
3230 NSTAT=NSTAT+1	2515
LSTAT=NSTAT	2516
IF(IPASS.LT.NPASS) GO TO 200	2517
3240 JA=1	2518
IPASS=1	2519
N=0	2520
MA=0	2521
IF (NPROJ.LE.0) GO TO 3310	2522
C * * * * * PROJECTED FLOW SEQUENCES * * * * *	2523
3250 JA=IYRPJ-IYRA	2524
NJ=LYRPJ-IYRA	2525
ITMP=0	2526
ITP=MTHPJ-IMNTH-1	2527
IF(ITP.NE.0) GO TO 3260	2528
ITMP=12	2529
3260 IF (ITP.LT.1) ITP=ITP+12	2531
MA=(JA-1)*12+ITP+1-ITMP	2532
DO 3290 K=1,NSTA	2533
IF (SD(ITP,K).EQ.0..OR.MA.EQ.1) GO TO 3280	2534
TEMP=ALOG(O(MA,K)+DR(ITP,K))*4342943	2535
QPREV(K)=(TEMP-AV(ITP,K))/SD(ITP,K)	2536
IF (SKEW(ITP,K).EQ.0.) GO TO 3290	2537
TEMP=.5*SKEW(ITP,K)*QPREV(K)+1.	2538
TMP=1.	2539
IF (TEMP.GE.0.) GO TO 3270	2540
TEMP=(-TEMP)	2541
TMP=(-TMP)	2542
3270 QPREV(K)=6.*(TMP*TEMP**((1./3.)-1.)/SKEW(ITP,K)+SKEW(ITP,K)/6.	2543
GO TO 3290	2544
3280 QPREV(K)=0.	2545
3290 CONTINUE	2546
JX=IYRPJ-1	2547
C N = SEQUENCE NO., M = MONTH NO., JX = YEAR NO.	2548
3300 N=N+1	2549
GO TO 3330	2550
C START WITH ZERO DEVIATION AT ALL STATIONS	2551
3310 DO 3320 K=1,NSTA	2552
3320 QPREV(K)=0.	2553
C GENERATE 2 YEARS FOR DISCARDING	2554
NJ=2	2555
JX=-2	2556
3330 IF(NPASS.LE.1) GO TO 3400	2557
IF(IPASS.GT.1) GO TO 3340	2558
REWIND ISTAT	2559
NOTAP=0	2560
ISTAP=0	2561
3340 REWIND IQTAP	2562
LQTAP=0	2563
READ(ISTAT)NSTYX,NSTA,(ISTA(K),K=1,NSTA)	2564
NSTY=NSTYX-1	2565
IF(NSTY.LE.0) GO TO 3380	2566

ITP=NJ*12+1	2567
DO 3370 K=1,NSTX	2568
IF(IPASS.LE.1) GO TO 3360	2569
3350 READ(IQTAP) ITEMP,(Q(M,K),M=2,ITP)	2570
LOTAP=LOTAP+1	2571
IF(ITEMP.NE.ISTA(K)) GO TO 3350	2572
3360 READ(ISTAT) IP,(AV(I,K),SD(I,K),SKEW(I,K),DQ(I,K),(BETA(I,K,L),L=1	2573
1,NSTA),ALCFT(I,K),I=1,12)	2574
3370 CONTINUE	2575
3380 DO 3390 K=NSTXX,NSTA	2576
ISTAP=ISTAP+1	2577
IF(N.GT.0) QPREV(K)=QSTAP(ISTAP)	2578
3390 READ(ISTAT) IP,(AV(I,K),SD(I,K),SKEW(I,K),DQ(I,K),(BETA(I,K,L),L=1	2579
1,NSTA),ALCFT(I,K),I=1,12)	2580
CR * * * * * GENERATE CORRELATED STANDARD DEVIATE * * * * *	2581
3400 IF(IPASS.EQ.1) JXTMP=JX	2582
NCOMR=MCOMR(IPASS)	
NTADM=MTNDM(IPASS)	
DO 3420 K=1,NSTA	2583
DO 3410 I=1,12	2584
AVG(I,K)=0.	2585
SDV(I,K)=0.	2586
3410 CONTINUE	2587
3420 CONTINUE	2588
IF(N.LE.0) GO TO 3440	2589
WRITE(6,10)	2590
WRITE(6,3430) N	2591
3430 FORMAT(27H GENERATED FLOWS FOR PERIOD,I3)	2592000
IF(NPASS.GT.1) WRITE(6,2650) IPASS	2593
3440 DO 3510 J=JA,NJ	2594
M=12*(J-1)+1	2595
DO 3500 I=1,12	2596
M=M+1	2597
IF(NSTX.LE.0) GO TO 3460	2598
DO 3450 K=1,NSTX	2599
3450 QPREV(K)=Q(M,K)	2600
3460 IF (M.LE.MA) GO TO 3500	2601
DO 3490 K=NSTXX,NSTA	2602
C RANDOM COMPONENT	2603
TEMP=0.	2604
DO 3470 L=1,6	2605
TEMP=TEMP+RNGEN(IXX)	2606
3470 TEMP=TEMP-RNGEN(IXX)	2607
TEMP=TEMP*ALCFT(I,K)	2608
DO 3480 L=1,NSTA	2609
3480 TEMP=TEMP+BETA(I,K,L)*QPREV(L)	2610
AVG(I,K)=AVG(I,K)+TEMP	2611
SDV(I,K)=SDV(I,K)+TEMP*TEMP	2612
Q(M,K)=TEMP	2613
QPREV(K)=TEMP	2614
3490 CONTINUE	2615
3500 CONTINUE	2616
3510 CONTINUE	2617
IF(NPASS.LE.1) GO TO 3550	2618
3520 IF(LOTAP.EQ.NQTAP) GO TO 3530	2619
READ(IQTAP)	2620
LOTAP=LOTAP+1	2621
GO TO 3520	2622
3530 ITP=NJ*12+1	2623
ISTAP=ISTAP-NSTA+NSTX	2624
DO 3540 K=NSTXX,NSTA	2625
WRITE(IQTAP) ISTA(K),(Q(M,K),M=2,ITP)	2626
NQTAP=NQTAP+1	2627
ISTAP=ISTAP+1	2628
IF(ISTAP.GT.KSTAP) GO TO 160	2629
3540 QSTAP(ISTAP)=Q(ITP,K)	2630
3550 ANLOG=NJ-JA+1	2631
DO 3670 K=NSTXX,NSTA	2632 *
IF(NJ+JXTMP.GT.0) WRITE(6,2660) (NO(I),I=1,12)	2633 *
DO 3560 I=1,12	2634
AVG(I,K)=AVG(I,K)/ANLOG	2635
SDV(I,K)=((SDV(I,K)+AVG(I,K)**2*ANLOG)/ANLOG)**.5	2636

3560	CONTINUE	2638
	JX=JXTMP	2640
	DO 3660 J=JA,NJ	2641
	JX=JX+1	2642
	M=12*J-11	2643
	IF (JX.LE.0) GO TO 3660	2644
	ITP=0	2645
	DO 3650 I=1,12	2646
	M=M+1	2647
	IF (M.LE.MA) GO TO 3640	2648
C	TRANSFORM TO LOG PEARSON TYPE III VARIATE (FLOW)	2649
	TMP=SKEW(I,K)	2650
	IF (ANLOG.GT.19..AND.SDV(I,K).GT.0.)	
S	Q(M,K)=(Q(M,K)-AVG(I,K))/SDV(I,K)	
	IF (TMP.EQ.0.) GO TO 3600	
C		2651
	TMP=((TMP*(Q(M,K)-TMP/6.)/6.+1.)*3-1.)*2./TMP	WITHDREW 2652 *
	TEMP=(-2.)/SKEW(I,K)	2653
	IF (SKEW(I,K)) 3580,3600,3590	2654
3580	IF (TMP.GT.TEMP) TMP=TEMP	2655
	GO TO 3610	2656
3590	IF (TMP.LT.TEMP) TMP=TEMP	2657
	GO TO 3610	2658
3600	TMP=Q(M,K)	2659
3610	IF (TMP.GT.2..AND.SD(I,K).GT..3) TMP=2.+(TMP-2.)*.3/SD(I,K)	2660
	TMP=TMP*SD(I,K)+AV(I,K)	2661
	Q(M,K)=10.**TMP-DQ(I,K)	2662
	ITMP=NSUM(K,IPASS)	2663
	IF (ITMP.LE.0) GO TO 3630	
	TEMP=0.	2666
	DO 3620 L=1,ITMP	2667
	LX=IST(K,L,IPASS)	
3620	TEMP=TEMP+Q(M,LX)	2669
	IF (Q(M,K).LT.TEMP) Q(M,K)=TEMP	2670
3630	IF (Q(M,K).LT.0..AND.QMIN(I,K).GE.0.) Q(M,K)=0.	2671
3640	IQ(I)=Q(M,K)+.5	2672
	ITP=ITP+IQ(I)	2673
3650	CONTINUE	2674
C		WITHDREW 2675 *
	IQ(13)=ITP	2676
	WRITE (6,100) ISTA(K),JX,(IQ(I),I=1,13)	2677
	IF (IPCHQ.LE.0) GO TO 3660	2678
	WRITE (7,2730) ISTA(K),JX,(IQ(I),I=1,12)	2679
3660	CONTINUE	2680
3670	CONTINUE	2681
	IF (NCOMB.LE.0) GO TO 3720	2682
	DO 3710 J=JA,NJ	2683
	M=12*J-11	2684
	DO 3700 I=1,12	2685
	M=M+1	2686
C	COMPUTE COMBINATION FLOWS	2687
	DO 3690 KX=1,NCOMB	2688
	K=KV+NSTA	2689
	ITP=NSTAC(KX,IPASS)	
	Q(M,K)=0.	2691
	DO 3680 L=1,ITP	2692
	ITEMP=KSTAC(KX,L,IPASS)	
3680	Q(M,K)=Q(M,K)+Q(M,ITEMP)*C3TAC(KX,L,IPASS)	
3690	CONTINUE	2695
3700	CONTINUE	2696
3710	CONTINUE	2697
3720	IF (N.LT.NPROJ) GO TO 3250	2698
	IF (NYMXG.LE.0) GO TO 3800	2699
CS	***** MAX AND MIN GENERATED FLOWS *****	2700
	IF (JX.LE.0) GO TO 3870	2701
C	SKIP MAXMIN IF REMAINING YEARS INSUFFICIENT	2702
	IF (JX.GT.0.AND.NJ.LT.NYMXG) GO TO 150	2703
	ITRNS=0	2704
3730	ITP=NSTA+NCOMB	2705
	DO 3800 K=NSTXX,ITP	2706
C	MAX CALENDAR MO 1-12, MAX MO 13, 6-MO 14, 54-MO 15	2707
	DO 3740 I=1,15	2708

3740	SMQ(I,K)=-T	2709
C	MIN CALENDAR MO 16-27, MIN MO 28, 6-MO 29, 54-MO 30	2710
	DO 3750 I=16,30	2711
3750	SMQ(I,K)=T	2712
C	TMP = 6-MO, TEMP = 54-MO VOLUME, TMPA = 1-MO	2713
	TEMP=0.	2714
	TMP=0.	2715
	AVGO(K)=0.	2716
	NO=0	2717
	M=1	2718
	IF(ITRNS.GT.0) M=(M-1)*MXRCS*12+1	2719
	DO 3790 J=1,NJ	2720
	DO 3780 I=1,12	2721
	IX=I+15	2722
	M=M+1	2723
	TMPA=Q(M,K)	2724
	AVGO(K)=AVGO(K)+TMPA	2725
	NO=NO+1	2726
	IF(TMPA.GT.SMQ(I,K))SMQ(I,K)=TMPA	2727
	IF(TMPA.LT.SMQ(IX,K))SMQ(IX,K)=TMPA	2728
	IF(TMPA.GT.SMQ(13,K))SMQ(13,K)=TMPA	2729
	IF(TMPA.LT.SMQ(28,K))SMQ(28,K)=TMPA	2730
	TMP=TMP+TMPA	2731
	TEMP=TEMP+TMPA	2732
	IF(M.LT.8)GO TO 3760	2733
	TMP=TMP-Q(M-6,K)	2734
	IF(TMP.GT.SMQ(14,K))SMQ(14,K)=TMP	2735
	IF(TMP.LT.SMQ(29,K))SMQ(29,K)=TMP	2736
	IF(M.LT.56)GO TO 3770	2737
	TEMP=TEMP-Q(M-54,K)	2738
	IF(TEMP.GT.SMQ(15,K))SMQ(15,K)=TEMP	2739
	IF(TEMP.LT.SMQ(30,K))SMQ(30,K)=TEMP	2740
	GO TO 3780	2741
3760	SMQ(14,K)=TMP	2742
3770	SMQ(15,K)=TEMP	2743
3780	CONTINUE	2744
3790	CONTINUE	2745
C	AVERAGE MONTHLY FLOW	2746
	TEMP=NO	2747
	AVGO(K)=AVGO(K)/TEMP	2748
3800	CONTINUE	2749
	WRITE(6,10)	2750
	IF(ITRNS.GT.0)WRITE(6,3810)N,NJ	2751
3810	FORMAT (/27H MAXIMUM VOLUMES FOR PERIOD,13,3H OF,14,	2752000
	142H YEARS OF RECORDED AND RECONSTITUTED FLOWS)	2753000
	IF(ITRNS.LE.0)WRITE(6,3820)N,NJ	2754
3820	FORMAT (/27H MAXIMUM VOLUMES FOR PERIOD,13,3H OF,14,	2755000
	125H YEARS OF SYNTHETIC FLOWS)	2756000
	WRITE(6,810)(MO(I),I=1,12)	2757
	ITP=NSTA+NCONH	2758
	DO 3840 K=NSTXX,ITP	2759
	ITEMP=AVGO(K)+.5	2760
	DO 3830 I=1,15	2761
3830	IQ(I)=SMQ(I,K)+.5	2762
	WRITE(6,840)ISTA(K),(IQ(I),I=1,15),ITEMP	2763
3840	CONTINUE	2764
	WRITE(6,850)	2765
	WRITE(6,810)(MO(I),I=1,12)	2766
	DO 3860 K=NSTXX,ITP	2767
	DO 3850 I=1,15	2768
3850	IQ(I)=SMQ(I+15,K)+.5	2769
	WRITE(6,840)ISTA(K),(IQ(I),I=1,15)	2770
3860	CONTINUE	2771
C	TRANSFER BACK TO RECONSTITUTED FLOWS	2772
	IF(ITRNS.GT.0)GO TO 2920	2773
3870	NJ = NYMXG	2774
	GO TO 3890	2775
3880	NJ = KYR	2776
3890	IF(NPASS.LE.1) GO TO 3900	2777
	IPASS=IPASS+1	2778
	IF(N.EQ.0.AND.IPASS.LE.NPASS) GO TO 3310	2779
	IF(IPASS.LE.NPASS) GO TO 3340	2780

	IPAS3=1	2781
C	GO TO NEW JOB	2782
3900	IF(NYRG.LE.0) GO TO 150	2783
	IF(NJ.GT.NYRG)NJ=NYRG	2784
	NYRG=NYRG-NJ	2785
	GO TO 3300	2786
	END	2787
	SUBROUTINE CROUT(RX)	1001
	DIMENSION B(10),R(10,11),RX(10,11)	1002
	DOUBLE PRECISION R,B,RX	1003
	COMMON DTRMC,NINDP,B	1004
	NVAR=NINDP+1	1005
	DO 20 J=1,NINDP	1006
	B(J)=0.	1007
	DO 10 K=1,NVAR	1008
10	R(J,K)=RX(J,K)	1009
20	CONTINUE	1010
	IF(NINDP.GT.1)GO TO 30	1011
	B(1)=R(1,2)/R(1,1)	1012
	DTRMC=B(1)*B(1)	1013
	RETURN	1014
C	***** DERIVED MATRIX *****	1015
30	DO 40 K=2,NVAR	1016
40	R(1,K)=R(1,K)/R(1,1)	1017
	DO 80 K=2,NINDP	1018
	ITP=K-1	1019
	DO 60 J=K,NINDP	1020
	DO 50 I=1,ITP	1021
	L=K-I	1022
50	R(J,K)=R(J,K)-R(J,L)*R(L,K)	1023
	IF(J.EQ.K) GO TO 60	1024
	R(K,J)=R(J,K)/R(K,K)	1025
60	CONTINUE	1026
	DO 70 I=1,ITP	1027
	L=K-I	1028
70	R(K,NVAR)=R(K,NVAR)-R(L,NVAR)*R(K,L)	1029
	TEMP=DABS(R(K,K))	1030
	IF(TEMP.GT..000001) GO TO 80	1031
	DTRMC=1.5	1032
	RETURN	1033
80	R(K,NVAR)=R(K,NVAR)/R(K,K)	1034
C	***** BACK SOLUTION *****	1035
	B(NINDP)=R(NINDP,NVAR)	1036
	DO 100 I=2,NINDP	1037
	J=NVAR-I	1038
	IX=I-1	1039
	B(J)=R(J,NVAR)	1040
	DO 90 L=1,IX	1041
	K=J+L	1042
90	B(J)=B(J)-B(K)*R(J,K)	1043
100	CONTINUE	1044
	DTRMC=0.	1045
	DO 110 J=1,NINDP	1046
110	DTRMC=DTRMC+B(J)*RX(J,NVAR)	1047
	RETURN	1048
	END	1049
C	FUNCTION RNGEN(IX)	1001
C	RANDOM NUMBER SUBROUTINE FOR A BINARY MACHINE	1002
C	GENERATES UNIFORM RANDOM NUMBERS IN THE INTERVAL 0 TO 1	1003
C	GENERAL USAGE IS AS FOLLOWS	1004
C	A=RNGEN(IX)	1005
C	IX SHOULD BE INITIALIZED TO ZERO IN THE PROGRAM	1006
C	IARG CAN BE ANY LARGE, ODD INTEGER	1007
C	CONSTANTS MUST BE COMPUTED BY FOLLOWING EQUATIONS	1008
C	***** ICON1=((2**((B+1)/2))+3) *****	1009
C	***** ICON2=((2**B)+1) *****	1010
C	***** FCON3=1./((2.**B) *****	1011
C	WHERE B= NUMBER OF BITS IN THE INTEGER WORD	1012
C		1013
	DATA IARG/759821/	1014
	IF(IARG.EQ.IX) GO TO 10	1015
	IX=IARG	1016

IV=IX	1017
ICON1=16777219	1018
10 IV=IV+ICON1	1019
ICON2=281474976710655	1020
IF(IV.LT.0) IV=IV+ICON2+1	1021
RNGEN=IV	1022
FCON3=.3552713678E-14	1023
RNGEN=RNGEN*FCON3	1024
RETURN	1025
END	1026





# EXHIBIT 7

INFUT DATA 723-X6-L2340

<u>CARD</u>	<u>VARIABLE</u>	<u>COMMENTS</u>
A		Three title cards, first must have A in column 1.
B		First specification card.
	1. IYRA	- Earliest year of record at any station.
	2. IMNTH	- Calendar month number of first month of water year.
	3. IANAL	- Indicator, positive value calls for statistical analysis routines.
	4. MXRCS	- Number of years in each period of recorded and re-constituted flows for which maximum and minimum values are to be obtained, dimensioned for 100.
	5. NYRG	- Total number of years of hypothetical flows to be generated.
	6. NYMXG	- Number of years in each period of generated flows which maximum and minimum values are to be obtained, dimensioned for 100.
	7. NPASS	- Number of consecutive passes, each pass consisting of a new group of stations which can be correlated with specified stations in previous passes, dimensioned for 5.
	8. IPCHQ	- Indicator, positive value calls for writing recorded and reconstituted flows and generated flows on Tape 7.
	9. IPCHS	- Indicator, positive value calls for writing statistics on Tape 7.
	10. NSTA	- Number of stations at which flows are to be generated, not required if flow data are supplied. NSTA + NCOMB (C-1) dimensioned for 10.
C		Second specification card.
	1. NCOMB	- Number of combinations of stations, the totals of which are used to obtain maximum and minimum flows, dimensioned for 2. If positive, provide D and E cards.
	2. NTNDM	- Number of tandem situations, compares sum of monthly values of upstream stations with downstream station and adjusts if value is less than sum and that station's value has been estimated or generated, dimension for 10. If positive, provide F card.
	3. NCSTY	Number of consistency tests. Adjusts standard deviation of a dependent station in tandem with an independent station to prevent frequency curves from crossing, dimensioned for 10. If positive, provide G card.

<u>CARD</u>	<u>VARIABLE</u>	<u>COMMENTS</u>
C (Cont'd)		
4.	IGNRL	- Indicator, + 1 calls for reading generalized statistics and using for generation, + 2 calls for computing generalized statistics from flow data and using for generation.
5.	NPROJ	- Number of projections of future flows from present conditions, usually 0.
6.	IYRPJ	- Year of start of each projection.
7.	MTHPJ	- Calendar month of start of each projection.
8.	LYRPJ	- Last year of each projection, number of recorded and reconstituted years plus number of projected years dimensioned for 100.
D		
		Identification of combination, NCOMB (C-1) sets of D and E cards.
1.	NSTAC	- Number of stations in this combination, dimensioned for 10.
2.	ISTAC	- Station number (NSTAC values).
E		
		Combining coefficients, NCOMB (C-1) sets of D and E cards.
1.	NSTAC	- Same as D-1.
2.	CSTAC	- Coefficient of flow used for adding, corresponds to respective items in D-2.
F		
		Identification of tandem situation, NTNDM (C-2) cards.
1.	ISTN	- Station number of downstream station.
2.	NSMX	- Number of upstream stations, dimensioned for 10.
3.	ISTT	- Station number of upstream station (NSMX values).
G		
		Identification of consistency test, NCSTY (C-3) cards.
1.	ISTX	- Independent station number.
2.	ISTY	- Dependent station number.
H		
		Flow data, cards in any order, omit if IANAL (B-3) is not positive, follow all flow data cards by 1 blank card (I card).
1.	Cols 2-4, Station number	
2.	Cols 5-8, Year number.	

<u>CARD</u>	<u>VARIABLE</u>	<u>COMMENTS</u>
H (Cont'd)		
	3.	Cols 9-14, 15-20, etc., Flow in desired units. Units should be selected so generated flows will not exceed 999,999. Use -1 for missing record. If record for entire year is missing, omit card for that year.
I		Card blank after Col 1 to indicate end of flow data, omit if IANAL (B-3) is not positive.
J		Identification of stations in previous passes to be used in current pass, supply only if NPASS (B-7) is greater than 1. The variables NCOMB, NTNDM, and NCSTY apply to the current pass only.
	1. NCOMB	- Number of combinations of stations, the totals of which are used to obtain maximum and minimum flows, dimensioned for 2. If positive, provide D and E cards.
	2. NTNDM	- Number of tandem situations, compares sum of monthly values of upstream stations with downstream station and adjusts if value is less than sum and that station's value has been estimated or generated, dimension for 10. If positive, provide F card.
	3. NCSTY	Number of consistency tests. Adjusts standard deviation of a dependent station in tandem with an independent station to prevent frequency curves from crossing, dimensioned for 10. If positive, provide G card.
	4. NSTX	- Number of stations from previous passes which are to be used with the additional data in current pass as a means of maintaining consistent flows between groups of stations, number of stations from previous passes plus number of new stations dimensioned for 10.
	5. ISTA	- Station number of station in a previous pass which is to be used in current pass (NSTX values). Must be in same order as stations first appear.
	Note:	Flow data for current pass supplied as described for H card and follow data with a blank card (I card), supply NPASS-1 sets of J, H, and I cards (also D,E,F, and G, if necessary) when NPASS greater than 1.
K		Preceding-month correlation coefficients for first station, omit if IANAL (B-3) is positive (NSTA cards).
	1. ISTA(K)	- Cols 2-4, Number of first station.
	2. ISTA(L)	- Cols 5-8, Number of station from 1 to NSTA (B-10) on successive cards. If IGNRL (C-4) = 1, only first card is used.
	3. RA(I,K,LX)	- Cols 9-14, 15-20, etc., Correlation coefficients for successive months between flows at first station and preceding-month flows at stations from 1 to NSTA (B-10) on separate cards. If IGNRL (C-4) = 1, only generalized coefficient (in cols 9-14) is given.

CARDVARIABLECOMMENTS

L\*

Current-month correlation coefficients, omit if IANAL (B-3) is positive, (NSTA-1) pairs of L and M cards.

1. ISTA(K) - Cols 2-4, Number of station, progressing from K = 2 through NSTA (B-10) stations on different sets of L and M cards.
2. ISTA(L) - Cols 5-8, Number of station, progressing on different cards through all stations from L = 1 to K-1.
3. RA(I,K,L) - Cols 9-14, 15-20, etc., Correlation coefficient for each successive calendar month between flows at station K and concurrent flows at station L (12 items). If IGNRL (C-4) = 1, only generalized coefficient in cols 9-14 is given.

M\*

Preceding-month correlation coefficients for remaining stations, omit if IANAL (B-3) is positive. Paired with L card.

1. ISTA(K) - Cols 2-4, Same station number as on corresponding L card (L-1).
2. ISTA(L) - Cols 5-8, Number of station, progressing in same order on different cards through all stations from L = 1 to NSTA (B-10). If IGNRL (C-4) = 1, only card with L = K is used.
3. RA(I,K,LX) - Cols 9-14, 15-20, etc., Correlation coefficient for each successive calendar month between flows at station K and flows in preceding month at station L (12 items). If IGNRL (C-4) = 1, only generalized coefficient in Cols 9-14 is given.

N

Generalized frequency statistics, omit if IANAL (B-3) is positive or IGNRL (C-4) does not equal 1.

1. ISTA(K) - Cols 2-8, Station number for NSTA (B-10) stations on successive cards in same order as supplied by L cards (L-1).
2. AVMX(K) - Cols 9-14, Average mean logarithm for wet season (3 months).
3. AVMN(K) - Cols 15-20, Average mean logarithm for dry season (3 months).
4. SDAV(K) - Cols 21-26, Average standard deviation for the 12 months.

\* Sets of L and M cards are required for each station from K = 2 to NSTA.

<u>CARD</u>	<u>VARIABLE</u>	<u>COMMENTS</u>
N (Cont'd)		
	5. MOMX(K)	- Calendar number of last month of wet season.
	6. MOMN(K)	- Calendar number of last month of dry season.
O		Mean logarithms, omit if IANAL (B-3) is positive or IGNRL (C-4) equals 1.
	1. ISTA(K)	- Same as (M-1).
	2. AV(I,K)	- Cols 9-14, 15-20, etc., Mean logarithms for successive calendar months.
P		Standard deviations, omit if IANAL (B-3) is positive or IGNRL (C-4) equals 1.
	1. ISTA(K)	- Same as (M-1).
	2. SD(I,K)	- Cols 9-14, 15-20, etc., Standard deviations for successive calendar months.
Q		Skew coefficients, omit if IANAL (B-3) is positive or IGNRL (C-4) equals 1.
	1. ISTA(K)	- Same as (M-1).
	2. SKEW(I,K)	- Cols 9-14, 15-20, etc., Skew coefficients for successive calendar months.
R		Flow increments, omit if IANAL (B-3) is positive or IGNRL (C-4) equals 1.
	1. ISTA(K)	- Same as (M-1).
	2. DQ(I,K)	- Cols 9-14, 15-20, etc., Flow increments for successive calendar months.

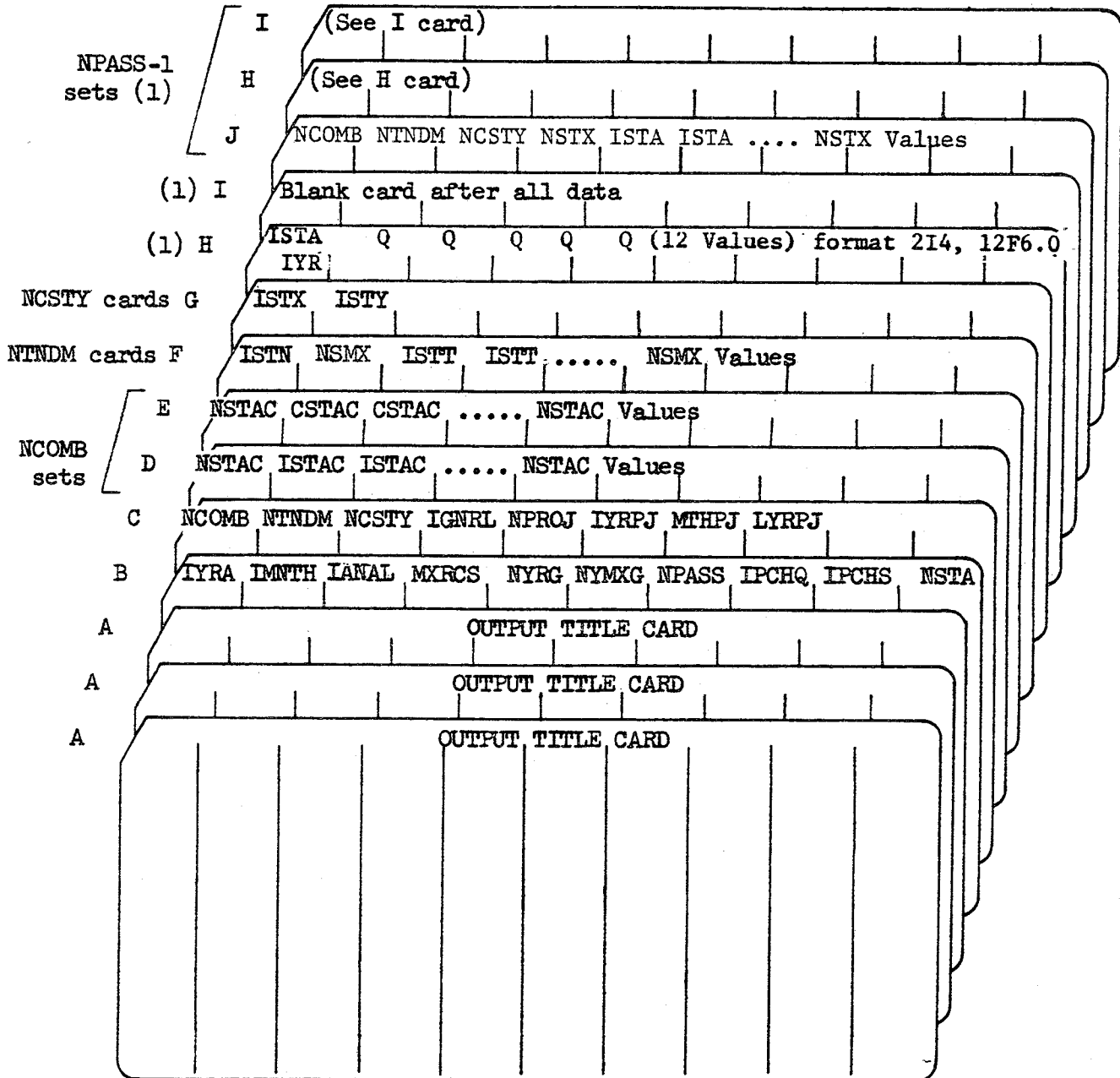
Five blank cards with A in Col 1 of first should follow last job.

Note: Cards K through R are not required if cards H and I are supplied. Cards K through R are as punched by computer when IPCHS is positive.



# EXHIBIT 8

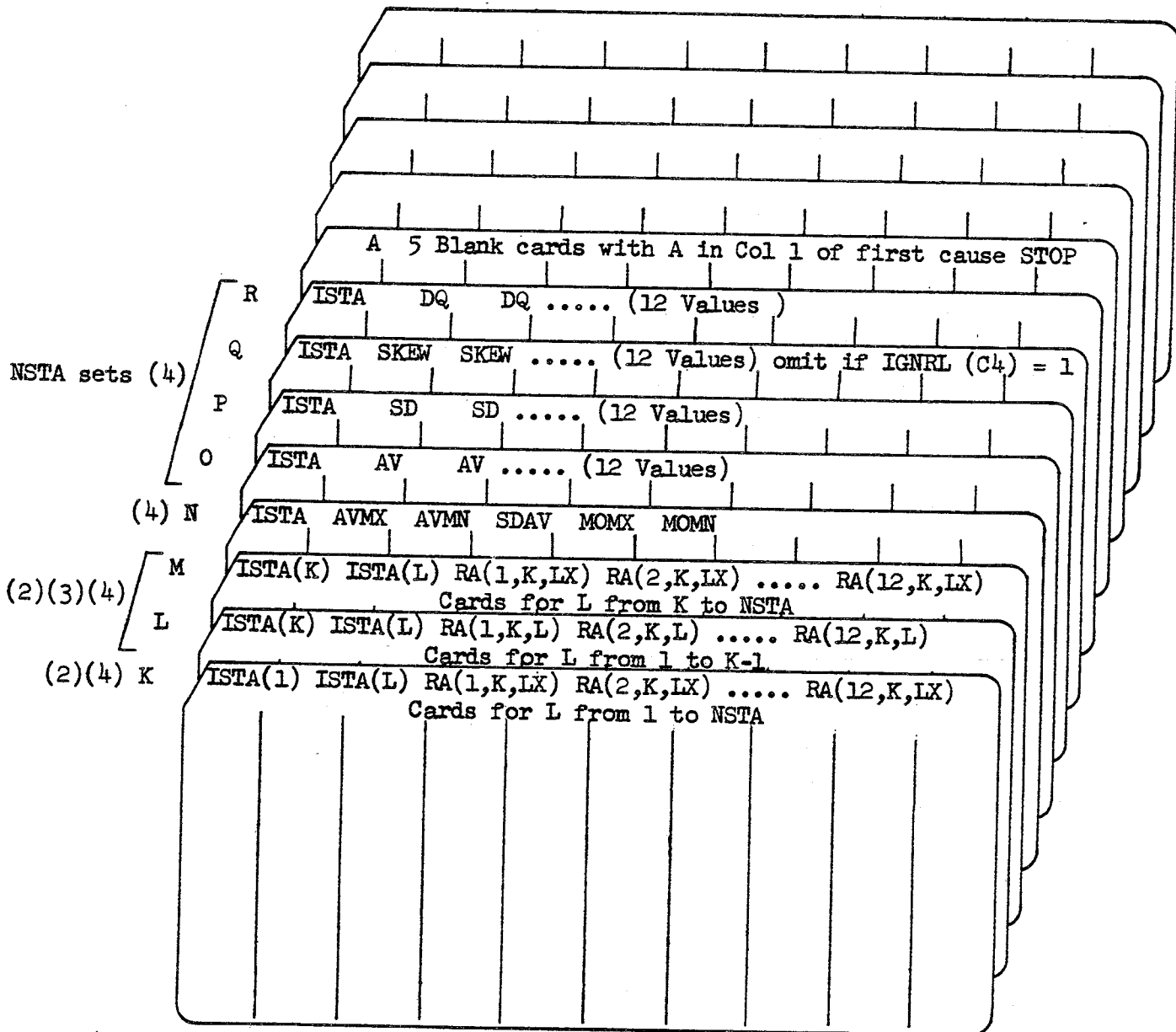
## SUMMARY OF REQUIRED CARDS 723-X6-L2340



### Notes:

- (1) Supply only if IANAL (B3) is positive. Repeat H card for each station-year of data before supplying I card.

SUMMARY OF REQUIRED CARDS  
Continued  
723-X6-L2340



- (2) L designates correlation with current month and LX with preceding month. If  $IGNRL(C4) = 1$ , only one (generalized) coefficient is given following station numbers on each card and only 1 K and M card is used for each K station, with  $L = K$ . Use same format as H card.
- (3) Repeat set of L and M cards for each K station except first.
- (4) Omit if  $IANAL(B3)$  is positive.